Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report	
RSY Pad: RSY 31 Use 2	Soil Origin: TU153B SFU
Data attached and submitted by: Amy Mangel	Data Report Submittal Date: 01/15/2021

Systematic Soil Sample Data: RSY 31 Use 2

Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total Beta Sr Final Analytical Results (pCi/g)	^{235}U Final Analytical Results (pCi/g)	^{239}Pu Final Analytical Results (pCi/g)
Project Remediation Goals*					1.661	0.141	0.331	0.195	2.59
HPPG-SFU-TU153B-001	1	Systematic	10,193	16,700	0.421	-0.0244	-0.0336	0.0389	-0.00216
HPPG-SFU-TU153B-002	2	Systematic	9,955	16,700	0.355	0.00132	N/A	N/A	N/A
HPPG-SFU-TU153B-003	3	Systematic	10,100	16,700	0.125	0.0269	N/A	N/A	N/A
HPPG-SFU-TU153B-004	4	Systematic	10,452	16,700	0.299	-0.0240	N/A	N/A	N/A
HPPG-SFU-TU153B-005	5	Systematic	10,375	16,700	0.411	0.0385	N/A	N/A	N/A
HPPG-SFU-TU153B-006	6	Systematic	9,982	16,700	0.274	-0.0164	N/A	N/A	N/A
HPPG-SFU-TU153B-007	7	Systematic	10,055	16,700	0.188	0.0248	N/A	N/A	N/A
HPPG-SFU-TU153B-008	8	Systematic	9,815	16,700	0.325	0.00987	N/A	N/A	N/A
HPPG-SFU-TU153B-009	9	Systematic	9,988	16,700	0.290	-0.0246	N/A	N/A	N/A
HPPG-SFU-TU153B-010	10	Systematic	9,540	16,700	0.177	0.00515	N/A	N/A	N/A
HPPG-SFU-TU153B-011	11	Systematic	10,104	16,700	0.256	-0.0153	-0.0145	0.0249	-0.0216
HPPG-SFU-TU153B-012	12	Systematic	10,032	16,700	0.304	-0.0170	N/A	N/A	N/A
HPPG-SFU-TU153B-013	13	Systematic	9,970	16,700	0.0817	0.00593	N/A	N/A	N/A
HPPG-SFU-TU153B-014	14	Systematic	10,171	16,700	0.255	-0.0710	N/A	N/A	N/A
HPPG-SFU-TU153B-015	15	Systematic	9,960	16,700	0.245	-0.0148	N/A	N/A	N/A
HPPG-SFU-TU153B-016	16	Systematic	10,107	16,700	0.292	-0.0333	N/A	N/A	N/A
HPPG-SFU-TU153B-017	17	Systematic	9,964	16,700	0.302	0.000167	N/A	N/A	N/A
HPPG-SFU-TU153B-018	18	Systematic	10,367	16,700	0.391	0.0598	N/A	N/A	N/A
HPPG-SFU-TU153B-019	19	Systematic	10,575	16,700	0.131	-0.0256	N/A	N/A	N/A
HPPG-SFU-TU153B-020	20	Systematic	10,533	16,700	0.319	0.0305	N/A	N/A	N/A
HPPG-SFU-TU153B-021	21	Systematic	10,591	16,700	0.347	0.00143	0.0180	0.00811	-0.00985
HPPG-SFU-TU153B-022	22	Systematic	11,060	16,700	0.304	0.0120	N/A	N/A	N/A
HPPG-SFU-TU153B-023	23	Systematic	9,708	16,700	0.389	0.0277	N/A	N/A	N/A
HPPG-SFU-TU153B-024	24	Systematic	10,010	16,700	0.294	-0.000617	N/A	N/A	N/A
HPPG-SFU-TU153B-025	25	Systematic	10,941	16,700	0.266	-0.0197	N/A	N/A	N/A

Soil Systematic Sample Statistics	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total Beta Sr Final Analytical Results (pCi/g)	^{235}U Final Analytical Results (pCi/g)	^{239}Pu Final Analytical Results (pCi/g)
Maximum	0.421	0.0598	0.0180	0.0389	-0.00216
Mean	0.2817	-0.0017	-0.01	0.0240	-0.0112
Median	0.294	0.0002	-0.0145	0.0249	-0.00985
Minimum	0.0817	-0.071	-0.0336	0.00811	-0.0216
Standard Deviation	0.0877	0.0276	N/A	N/A	N/A

Biased Soil Sample Data: RSY 31 Use 2

Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	^{226}Ra Final Analytical Results (pCi/g)	^{137}Cs Final Analytical Results (pCi/g)	Total Beta Sr Final Analytical Results (pCi/g)	^{235}U Final Analytical Results (pCi/g)	^{239}Pu Final Analytical Results (pCi/g)
Project Remediation Goals*					1.661	0.141	0.331	0.195	2.59
HPPG-SFU-TU153B-B-001	1	Biased	11,758	16,700	0.287	0.0160	0.0382	0.0162	0.00794

CPM Counts per minute

pCi/g Picocuries per gram

* Note: Project Remediation goal (RG) is the Record of Decision RG or Offsite RBA value, whichever is higher

Instrument and Survey Summary					
Activity	**Survey #**	**Date**	**Meter**	**Calibration Due Date**	**Serial #**
Gamma Walkover Survey	HPRS-10222020-PG-ROV-212	10/22/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-10222020-PG-JSS-217	10/22/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-10232020-PG-JSS-223	10/23/2020	3x3	10/15/2021	117652
Biased Sample Survey	HPRS-10232020-PG-JSS-222	10/23/2020	3x3	10/15/2021	117652

Region of Interest (ROI) Summary	
ROI	**Nuclide and Energy**
ROI 3	Ra-226 (1764 keV)
ROI 6	Ra-226 (609 keV)
ROI 7	Cs-137 (662 keV)
ROI 8	Ra-226 (351 keV)
ROI 10	Gross Gamma

Summary: RSY 31 Use 2

1) Gamma walkover survey and data review—upon review of initial RS-700 scan data in accordance with Final Parcel G Work Plan Section 3.5.1.1, 15 follow-up static investigations were required. Gamma scan data summary statistics, normal Q-Q plots, histograms, and box plots are provided on pages 3-6. Contour maps of the scan data for the ROIs of interest are presented on page 7. The RSY scan data was lower than the background scan data. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.

2) One-minute static follow-up measurements with the RS-700 were collected at 15 gamma walkover investigation locations in accordance with Final Parcel G Work Plan Section 3.3.1. A map of the follow-up locations is presented on page 9. The net follow-up static spectra are presented on pages 14-28. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.

3) In accordance with Final Parcel G Work Plan Section 3.4.1, twenty-five systematic soil samples (001-025) were obtained and submitted for gamma spectroscopy analysis. Sample locations are shown on the Systematic Sample Survey map (page 10). TestAmerica sample results are attached (pages 29-66). Ten percent of the systematic soil samples were also analyzed for total strontium, as well as for ^{235}U and ^{239}Pu by alpha spectroscopy. Total Strontium, ^{235}U, and ^{239}Pu results are also included in the TestAmerica sample results report (pages 29-66). Samples HPPG-F-019 and HPPG-F-020 are field duplicates, correlating to systematic samples -005 and -008. The Data Quality Assessment which will be included in the RACR will provide an analysis and discussion of field duplicates for the project. The Instrument and Survey Summary table above lists the 3x3 NaI detector used for the gamma static measurements collected during sampling activities, and the instrument-specific gamma static IL listed in the sample tables on page one is developed from that instrument's RBA data.

Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 12-13. All sample results were below the applicable RGs. The number of samples collected was sufficient to meet project DQOs.

4) In accordance with Final Parcel G Work Plan Section 3.3.1 and 3.4.1, one biased sample was collected since all follow-up static measurements were below the ROC-specific critical levels. The biased sample was collected from the location of the highest gross gamma scan measurement. TestAmerica sample results are attached (pages 67-83). A map of the biased sample location is presented on page 11. Biased sample results were all below the applicable RGs.

Conclusions:

In accordance with the DQOs in Section 3.1 of the Final Parcel G Work Plan, final analytical results for all samples from the RSY pad were shown by a point by point comparison to meet the RGs. Graphical comparisons demonstrated that ROC concentrations were consistent with background.

RSY 31 Use 2 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-153B SFU.

APTIM requests RASO concurrence to release this soil as Non-LLRW.
Disposition: This soil shall be used as backfill for TU-153.

Soil Scan Statistics

Statistical Summary

Dataset	PG-RSY-31-U2				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	3.01	28.06	12.15	12.02	3.43
ROI-06	50.10	122.27	83.96	84.17	9.65
ROI-07	41.09	99.21	65.08	65.13	8.57
ROI-08	75.16	147.33	106.28	106.23	11.04
ROI-10	1,974.28	2,443.54	2,192.23	2,188.31	78.52

Statistical Summary Reference Background

TYPE	Scan RBA (Bldg 809)				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	33.08	16.21	16.04	4.13
ROI-06	68.15	177.45	117.58	117.26	15.50
ROI-07	51.11	141.33	92.34	91.24	13.43
ROI-08	93.19	221.48	146.24	145.30	18.21
ROI-10	2,354.11	3,845.31	2,995.57	2,989.64	255.66

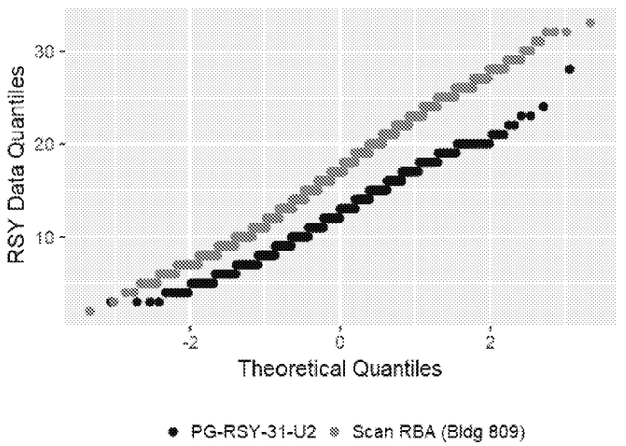
cps = counts per second

Dataset	Number of Data Points
PG-RSY-31-U2	1363
Scan RBA (Bldg 809)	4632

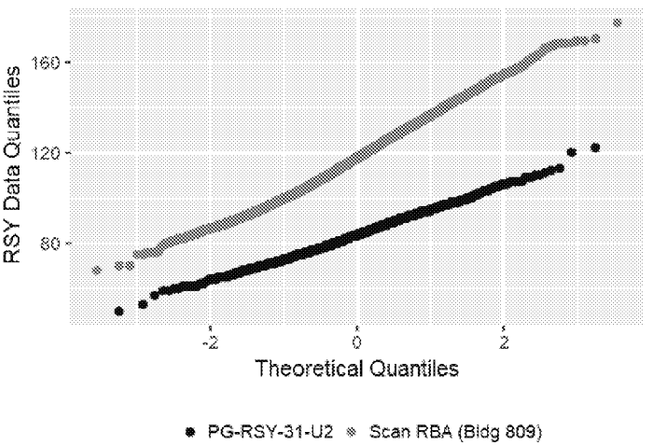
Soil Scan Statistics

Normal Q-Q Plots

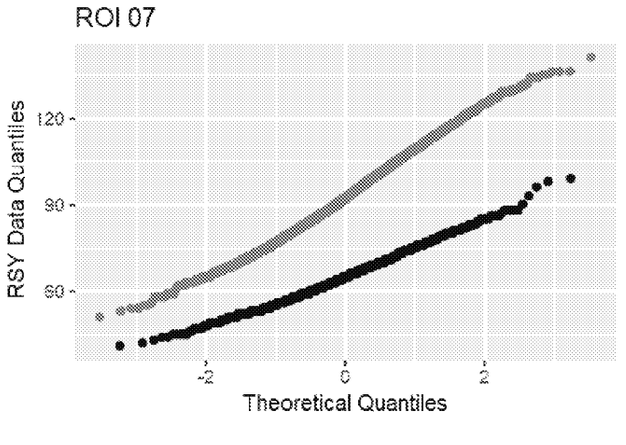
ROI 03



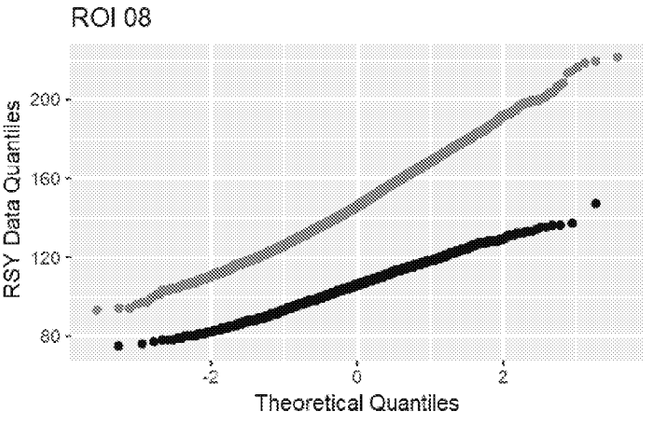
ROI 06



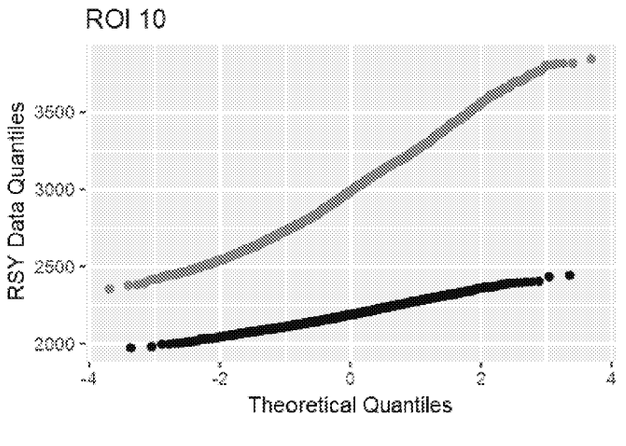
ROI 07



ROI 08



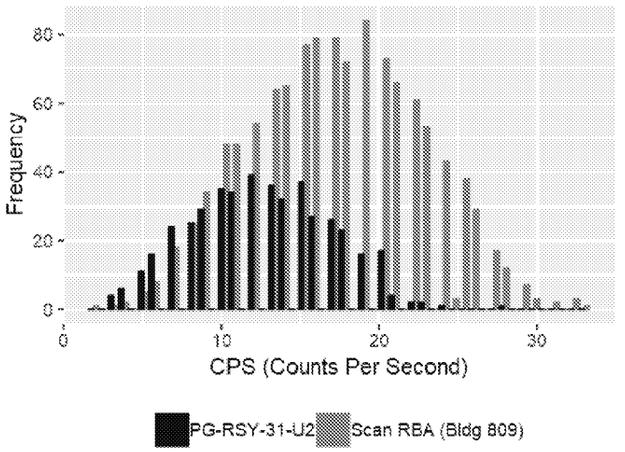
ROI 10



Soil Scan Statistics

Histograms

ROI 03



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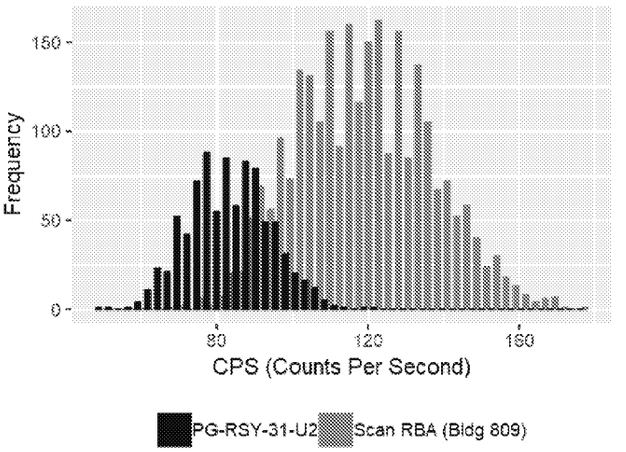

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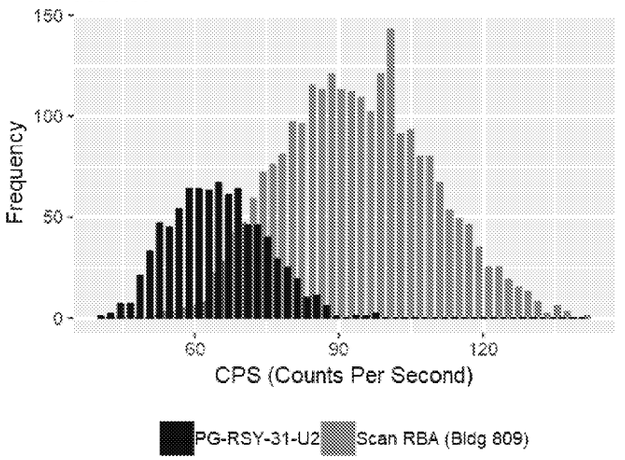

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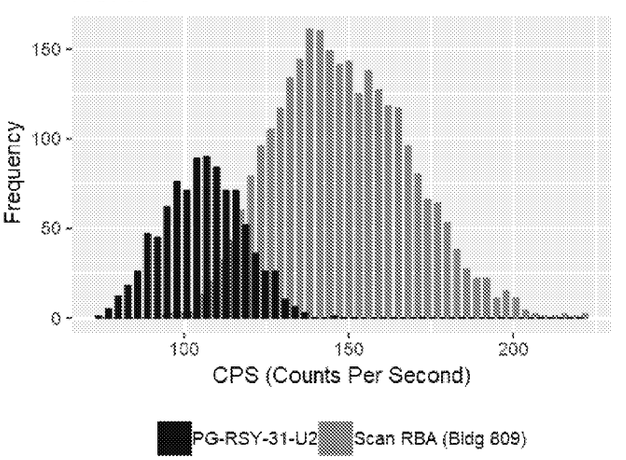
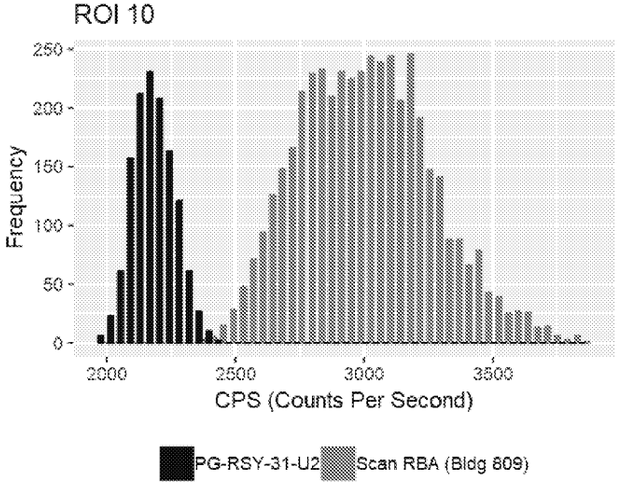


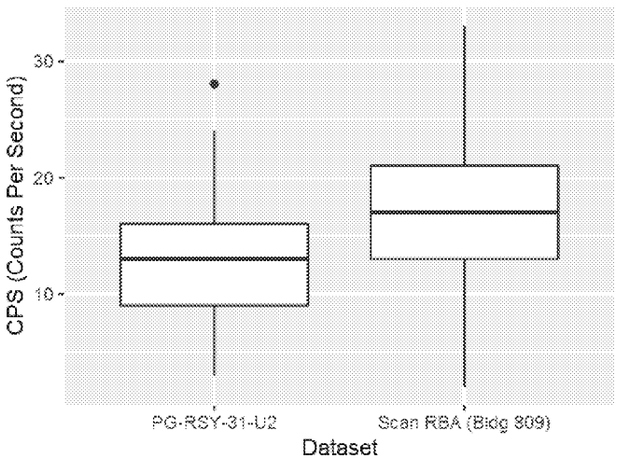
ROI 10



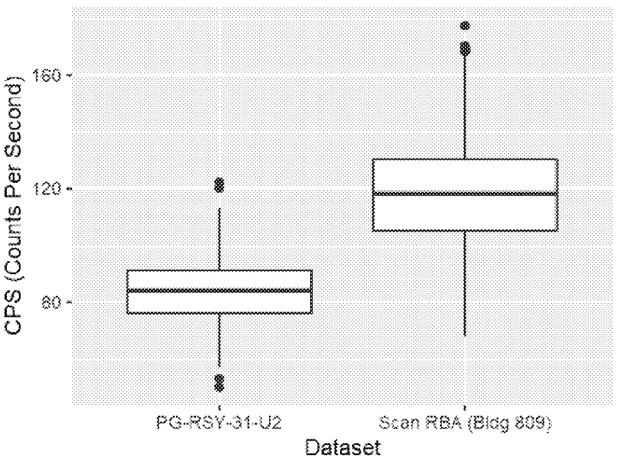
Soil Scan Statistics

Box Plots

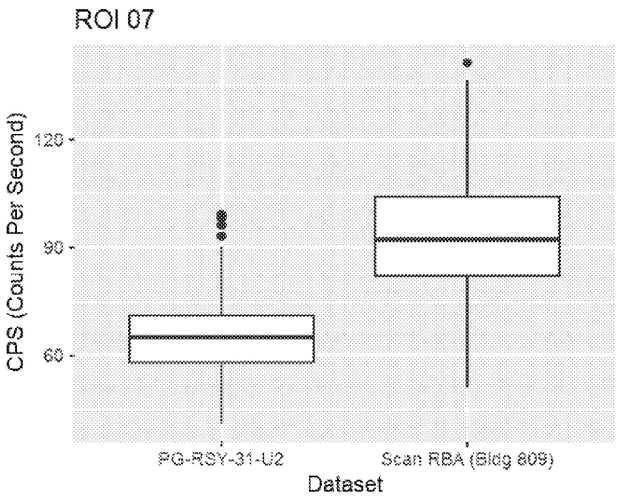
ROI 03



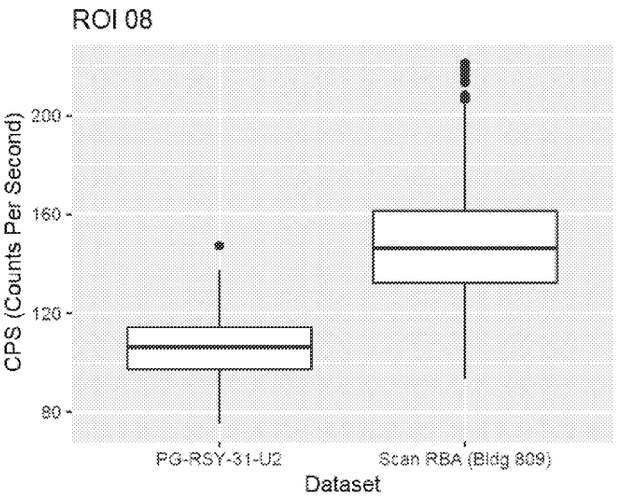
ROI 06



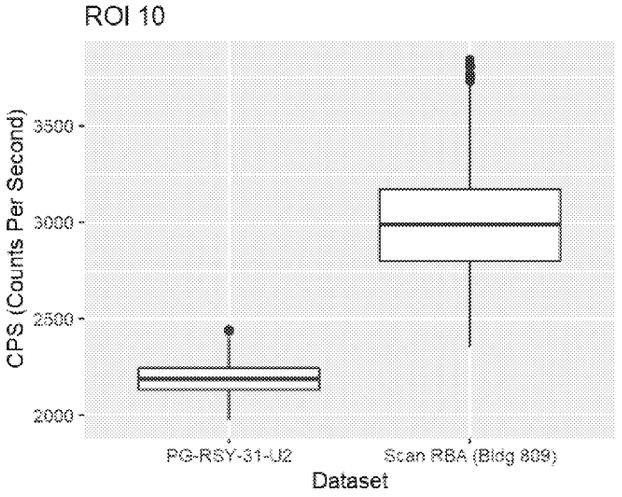
ROI 07



ROI 08

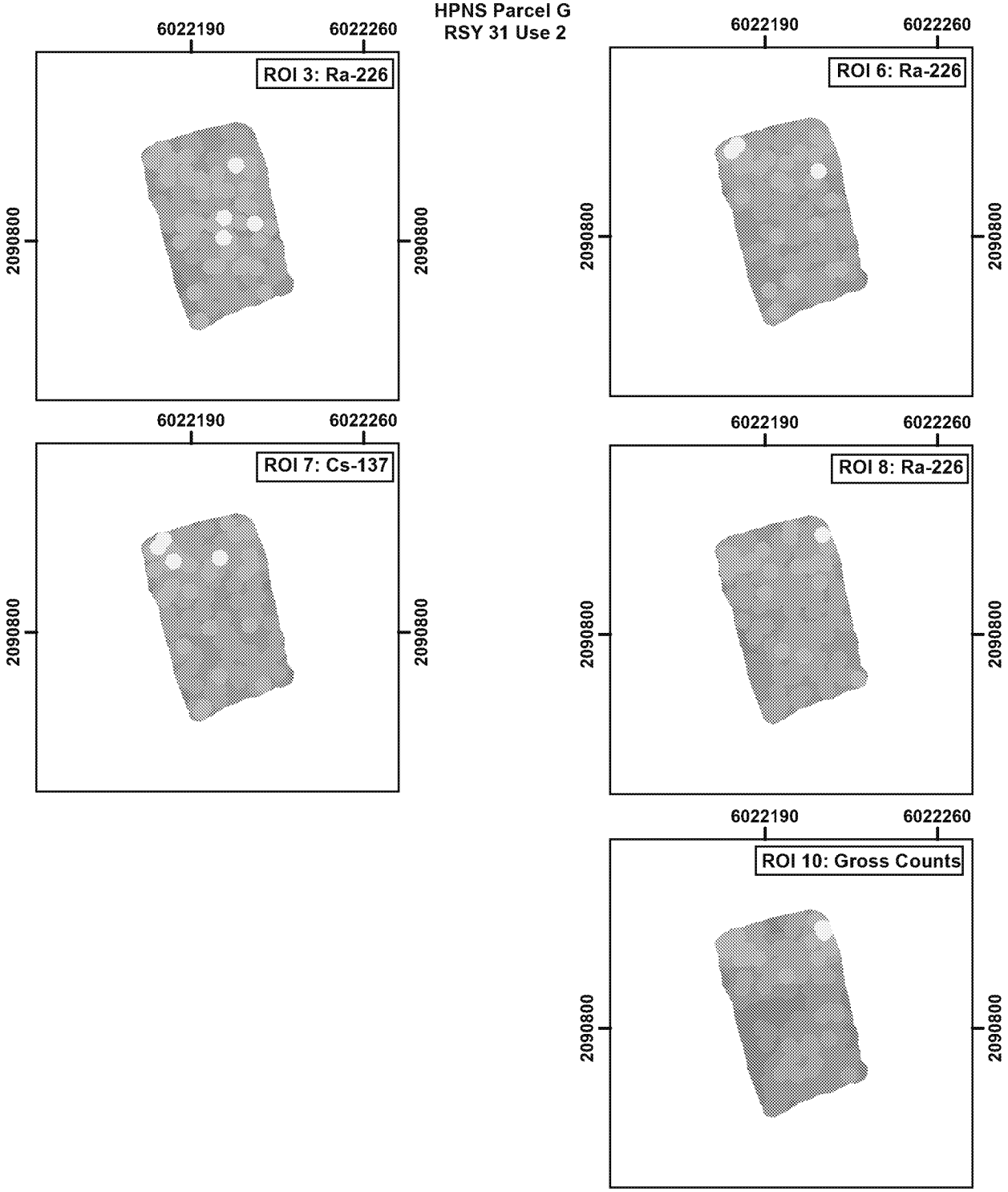


ROI 10



RSI Data Plots
HPNS Parcel G
RSY 31 Use 2

TU-153B SFU



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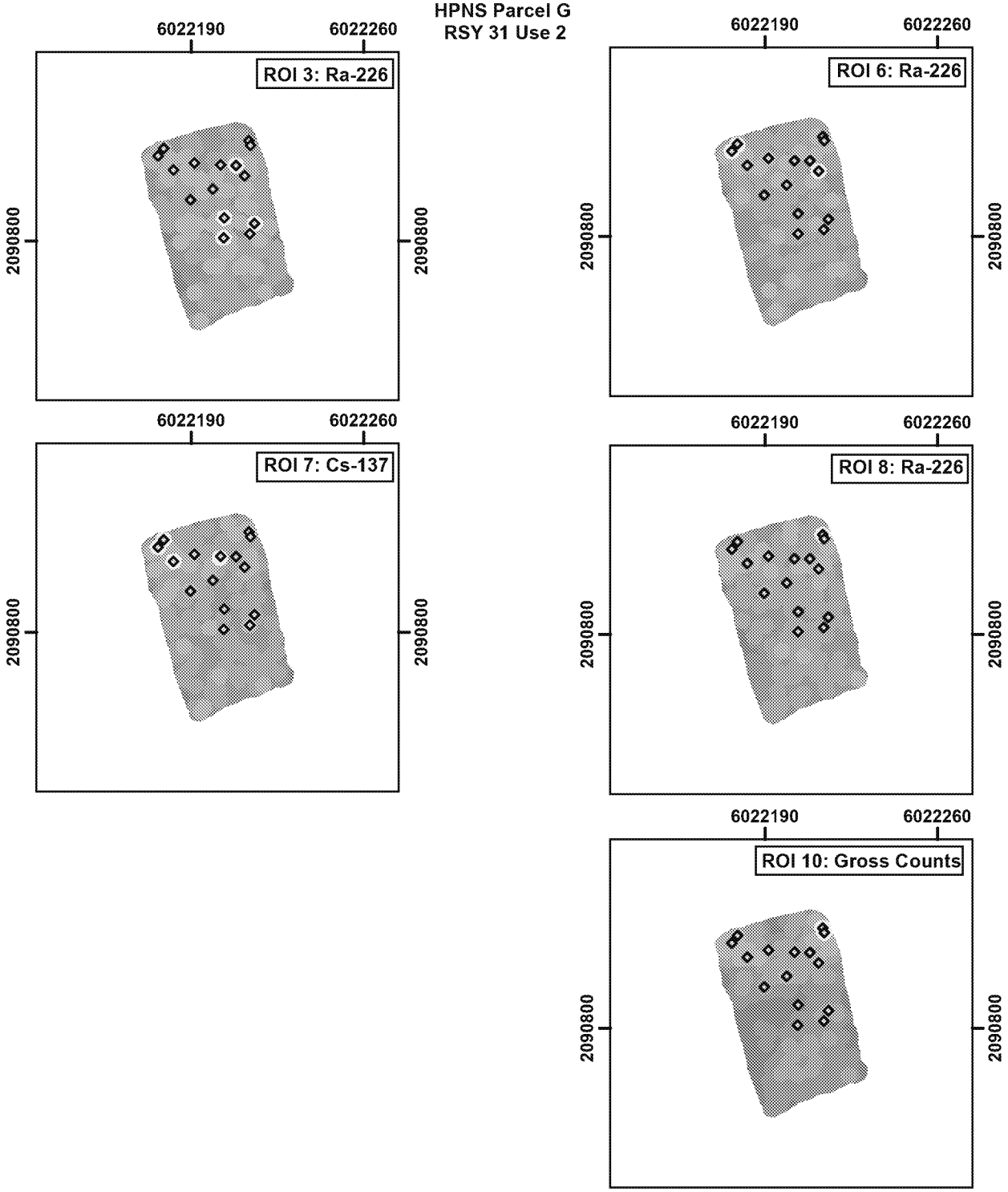
RSI Data Plots
HPNS Parcel G
RSY 31 Use 2

TU-153B SFU



RS 700 Gamma Walkover Survey Data (VD1)

- Follow-Up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

0 25 50 100 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

N

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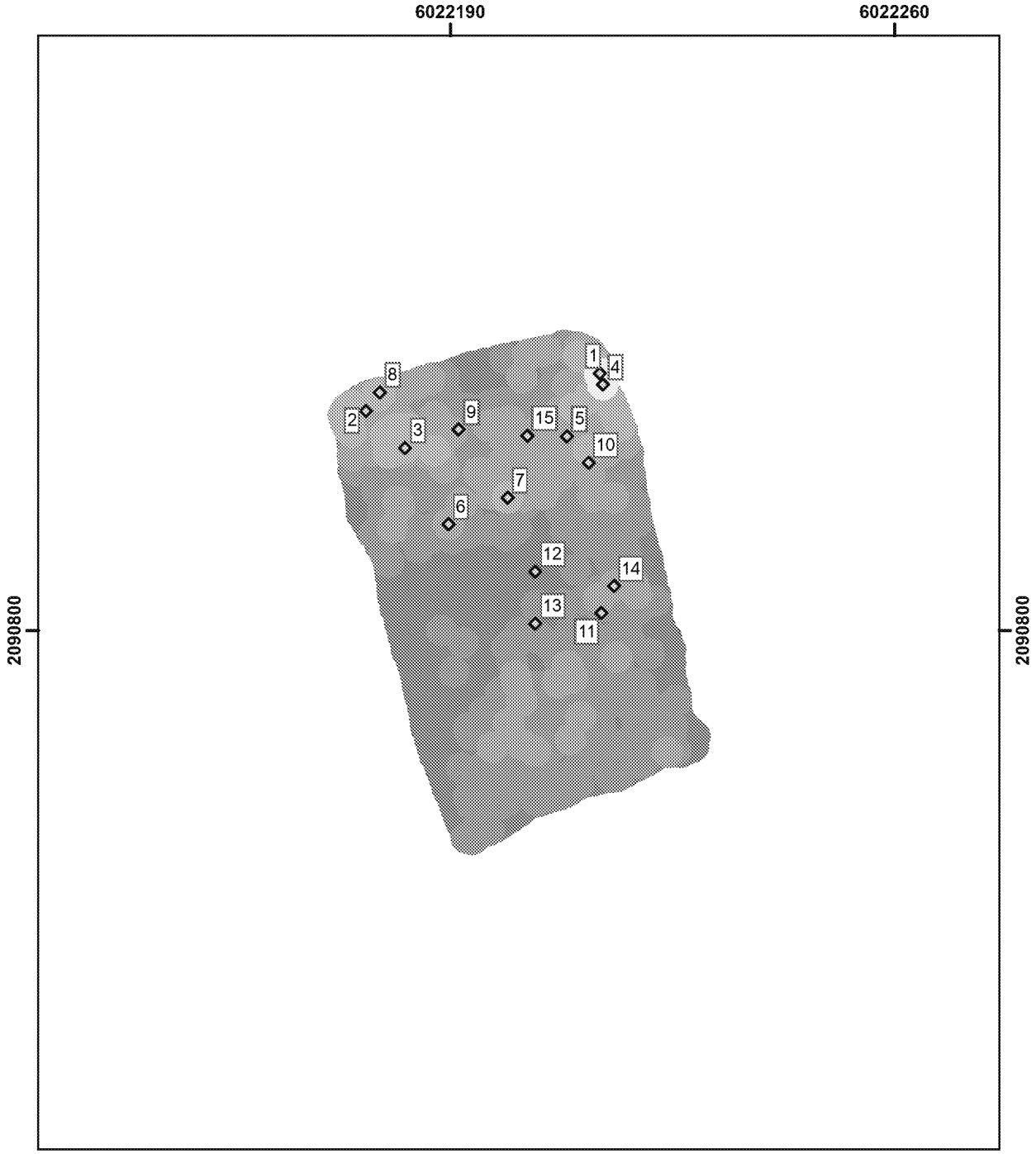
Follow-Up Static Survey
HPNS Parcel G
RSY 31 Use 2

TU-153B SFU



RSY 31 Use 2 (VD1, ROI 10 Gross Gamma)

- Follow-Up Locations
- > 3 std dev
- > 2 to < 3 std dev
- > 1 to < 2 std dev
- > 0 to < 1 std dev
- > -1 to < 0 std dev
- > -2 to < -1 std dev
- > -3 to < -2 std dev
- < -3 std dev

25 12.5 0 25 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

N

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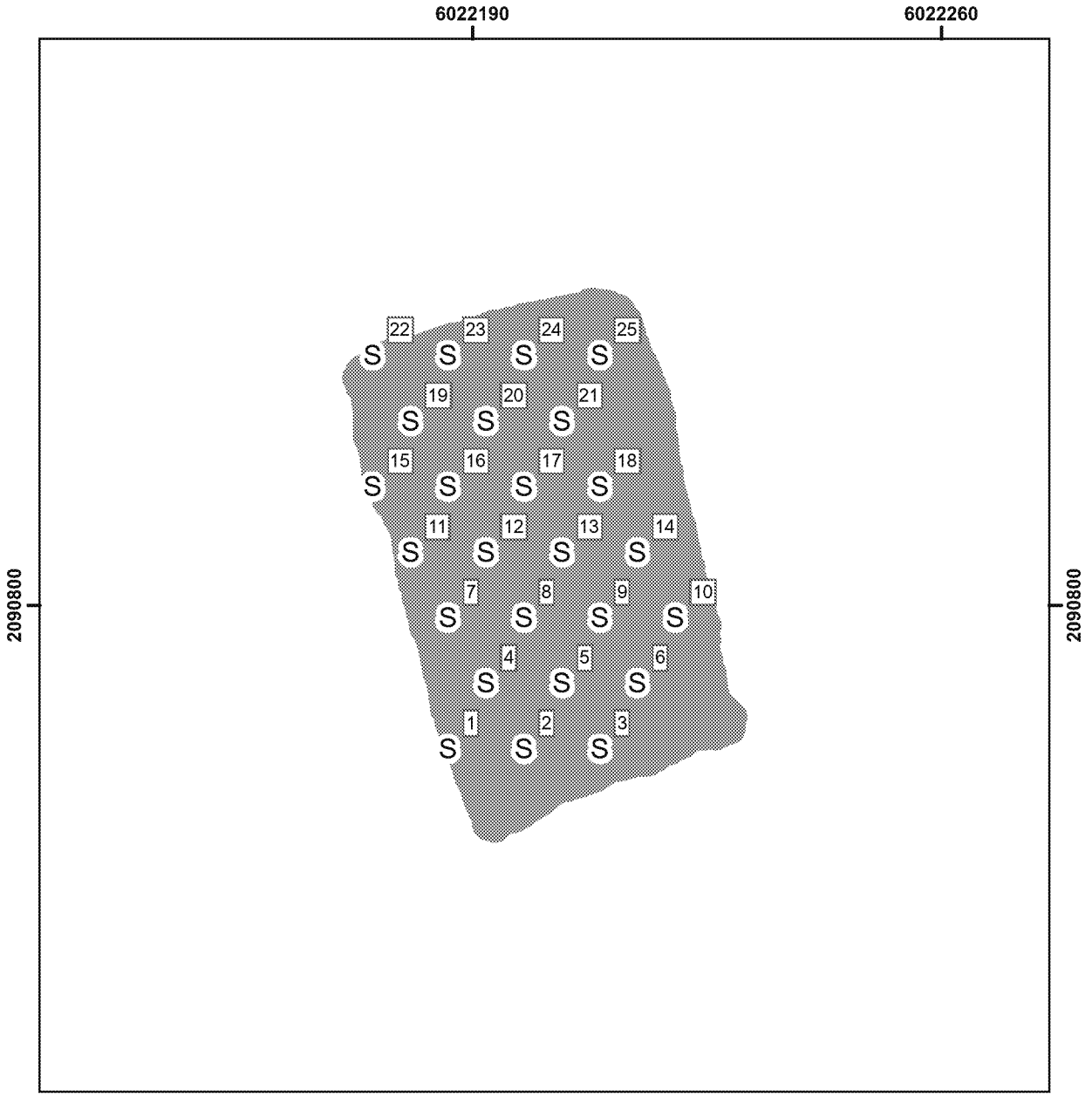
Systematic Sampling
HPNS Parcel G
RSY 31 Use 2

TU-153B SFU



RSY 31 Use 2

S Systematic Sample Locations

RS-700 GWS Coverage

0 10 20 40 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

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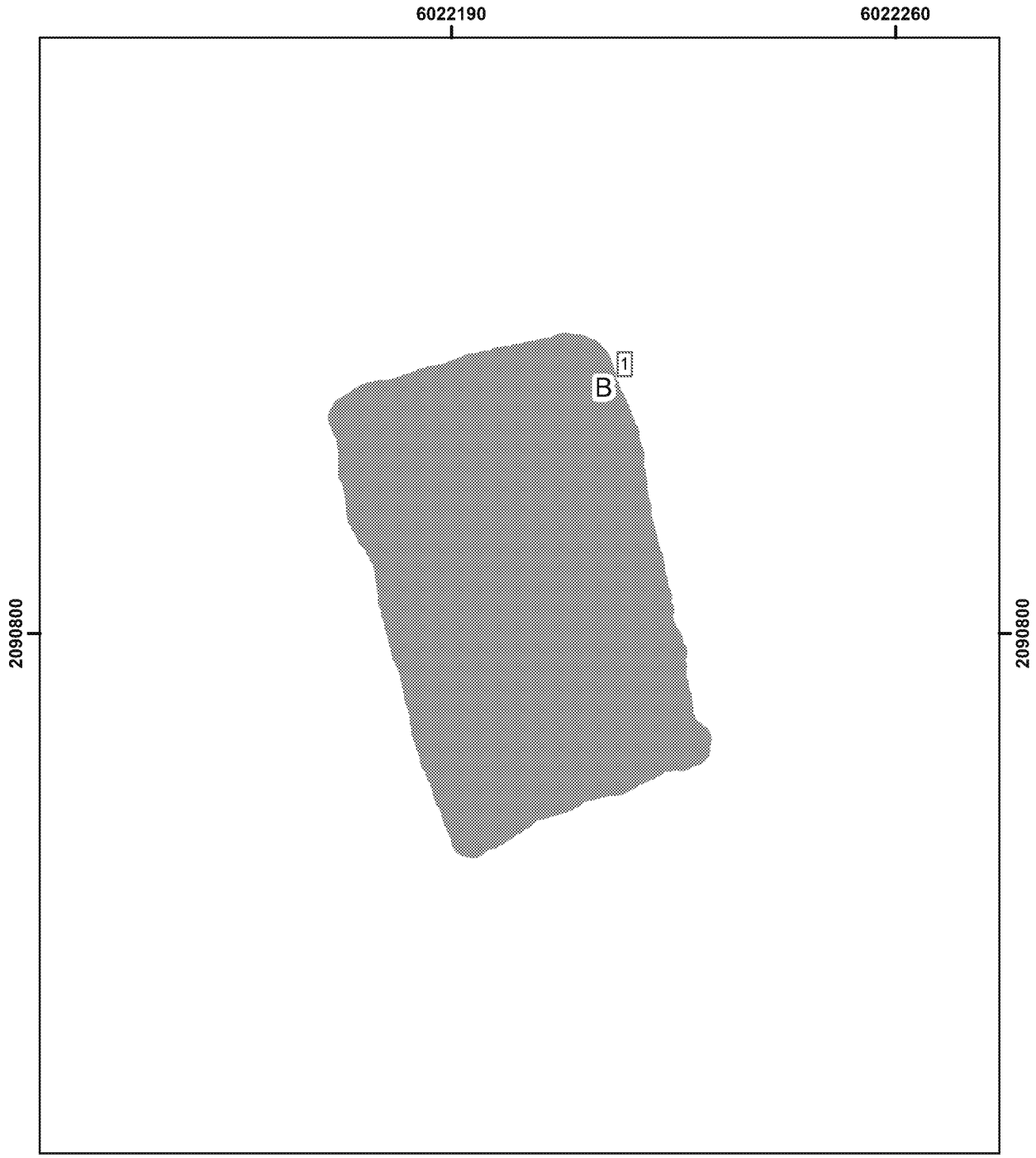
Biased Sampling
HPNS Parcel G
RSY 31 Use 2

TU-153B SFU



RSY 31 Use 2

B Biased Sample Location

RS-700 GWS Coverage

25 12.5 0 25 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot

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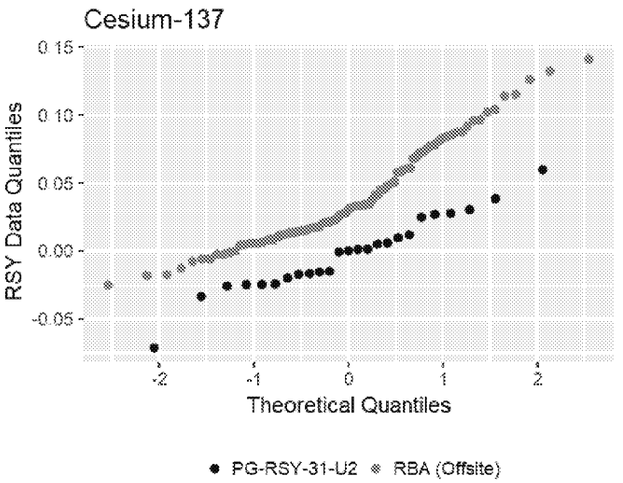
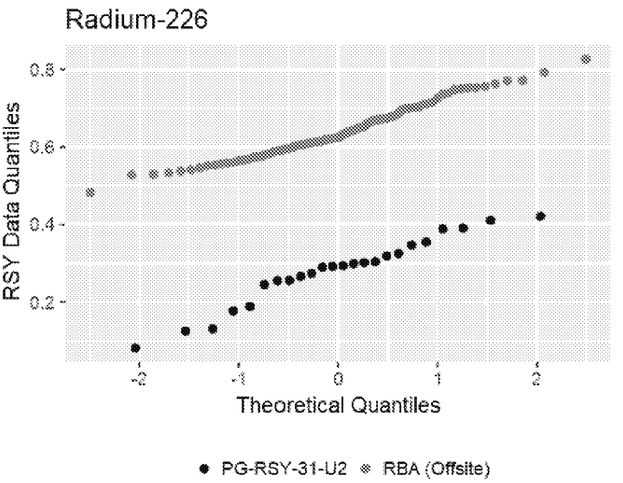
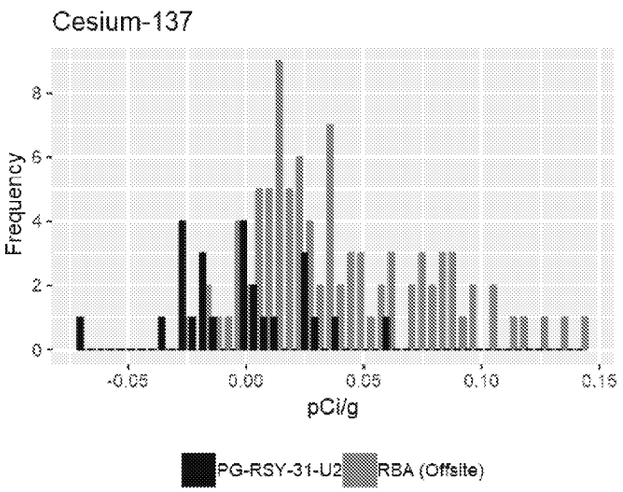
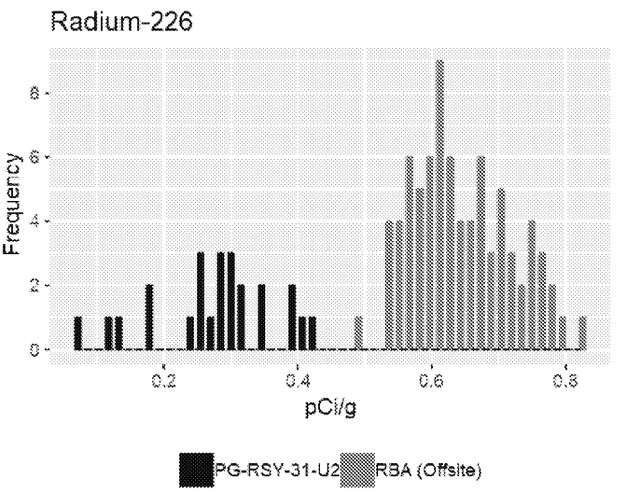
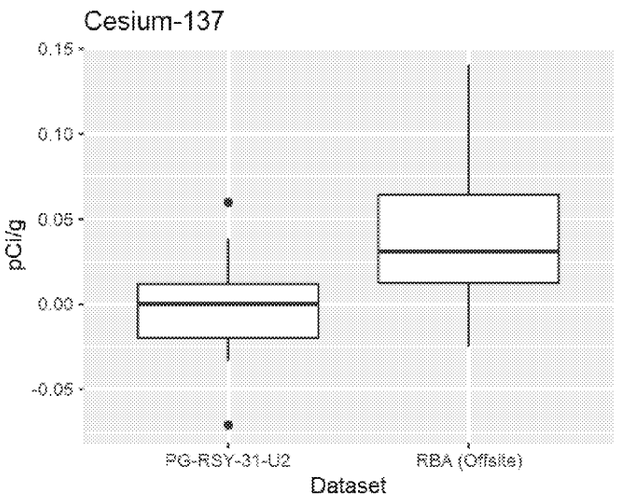
Soil Sample Statistics

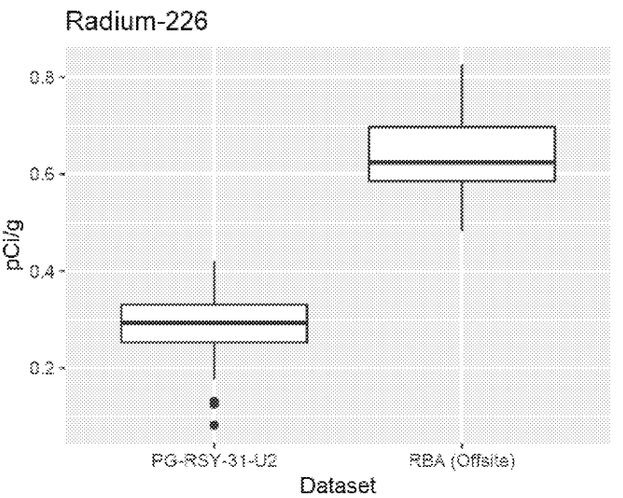












WILCOXON RANK SUM TEST

Nuclide: Ra-226 Location: [illegible]

LBGR: 0.294 pCi/g

DCGL LBGR = [illegible]

LBGR = 0.294

DATA	AREA	ADJUSTED DATA	RANKS	SURVEY UNIT RANKS	Sorted Ranks	Location Associated with Sorted Rank
[illegible]	R	0.588	48.5	0	1	[illegible]
[illegible]	R	0.687	101	0	2	[illegible]
[illegible]	R	0.566	40	0	3	[illegible]
[illegible]	R	0.633	75.5	0	4	[illegible]
[illegible]	R	0.608	38	0	5	[illegible]
[illegible]	R	0.652	87.5	0	6	[illegible]
[illegible]	R	0.613	52	0	7	[illegible]
[illegible]	R	0.711	109	0	8	[illegible]
[illegible]	R	0.68	99.5	0	9	[illegible]
[illegible]	R	0.508	30	0	10	[illegible]
[illegible]	R	0.541	31	0	11	[illegible]
[illegible]	R	0.588	48.5	0	12	[illegible]
[illegible]	R	0.673	56	0	13	[illegible]
[illegible]	R	0.674	57	0	14	[illegible]
[illegible]	R	0.492	26	0	15	[illegible]
[illegible]	R	0.753	121	0	16.5	[illegible]
[illegible]	R	0.748	115	0	16.5	[illegible]
[illegible]	R	0.58	37.5	0	18	[illegible]
[illegible]	R	0.614	54	0	19	[illegible]
[illegible]	R	0.529	27	0	20	[illegible]
[illegible]	R	0.605	57	0	21	[illegible]
[illegible]	R	0.575	44	0	22	[illegible]
		Sum =	7875	[illegible]		

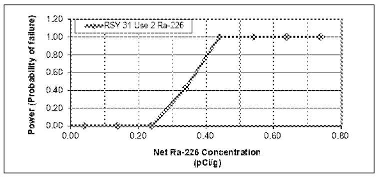
	SU Stats	
Count	25	*m*
SD	0.088	
Median	0.294	
	Ref Stats	
Count	100	*n*
SD	0.073	
Critical Value	1951.9	

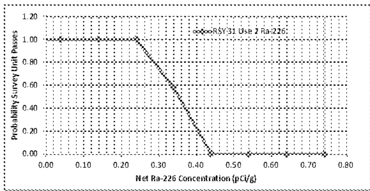
POWER CURVE CALCULATION

Concentration	Concentration above Background	(C-LBGR)/SD	p1	p2	E(Wmw)	Var(Wmw)	SD(Wmw)	z	Power	Probability of passing
[illegible]	-0.16	-5.2	0.00020	0.00001	0.51	3.572099	1.89	860.236	0.00	1.00
[illegible]	-0.11	-4.8	0.00030	0.00001	0.51	3.572099	1.89	860.236	0.00	1.00
[illegible]	-0.06	-4.0	0.00234	0.00017	5.8475	57.55651	7.583189	212.416	0.00	1.00
[illegible]	-0.01	-3.5	0.00666	0.00074	16.66	229.8282	15.16009	105.18	0.00	1.00
[illegible]	0.04	-2.9	0.01695	0.00289	42.3575	780.5102	27.93761	68.8673	0.00	1.00
[illegible]	0.14	-1.8	0.10155	0.03311	253.885	7239.827	85.08717	16.1304	0.00	1.00
[illegible]	0.24	-0.6	0.33959	0.18476	848.218	22730.33	150.7336	5.32208	0.00	1.00
[illegible]	0.34	0.5	0.63815	0.48259	1636.41	23744.63	154.0329	0.20084	0.42	0.58
[illegible]	0.44	1.7	0.86533	0.81302	2313.34	8310.205	91.16033	-8.439	1.00	0.00
[illegible]	0.54	2.8	0.97614	0.95662	2440.36	1214.679	34.85229	-23.356	1.00	0.00
[illegible]	0.64	3.9	0.99788	0.99560	2494.15	57.9840	7.61341	-113.96	1.00	0.00
[illegible]	0.74	5.1	0.99980	0.99960	2499.48	3.548908	1.627759	-536.9	1.00	0.00

Number of Samples

σ	0.088
LBGR	0.294
Δ/σ	3.03
Pr	1
N	25.23
N/2	13
Actual N	25
SU σ	0.088
Z(1-alpha)	[illegible]
Z(1-beta)	1.645





QUANTILE TEST

From NUREG 1505, Table A.7b Values of r and k for the Quantile Test When α Is Approximately 0.025

25 n (number of survey unit measurements)

100 m (number of reference area measurements)

Use:

m = 100

n = 25

4 r

3 k

0.025 alpha

If *k* or more of the *r* largest measurements in the combined ranked data set are from the survey unit, the null hypothesis of the Quantile test (that there is no residual radioactivity above the LBGR in any part of the survey unit) is rejected.

0 of the largest 4 adjusted measurements are from S.	The null hypothesis is accepted.

# of R:	100	*n*
# of S:	25	*m*
Avg Rank R:	75.5	
Avg Rank S:	13	

For *m* or *n* greater than 20, the critical value (k) can be calculated from

$$\frac{m(n+m+1)}{2} + z\sqrt{\frac{nm(n+m+1)}{12}}$$

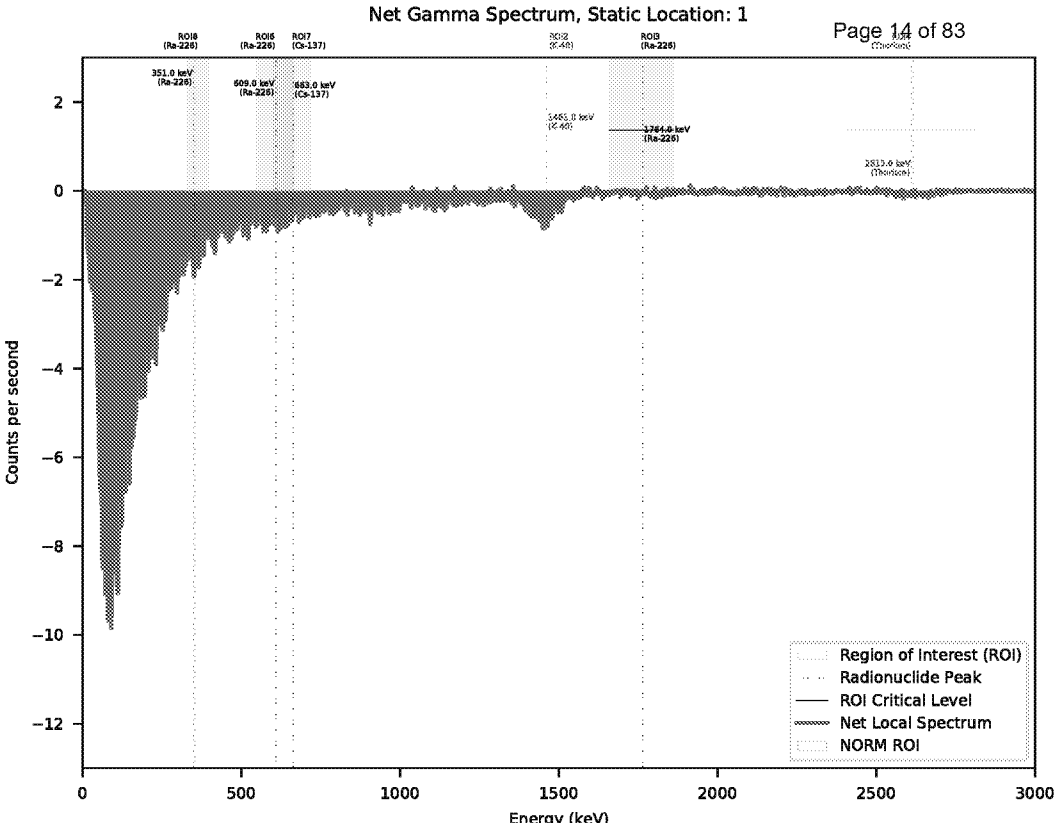
z = 99.0% percentile of standard normal distribution = 2.[illegible]

k = 1951.9

$\alpha_W = \alpha/2 =$ 0.01

$\beta =$ 0.05

Since the sum of survey unit ranks is less than the critical value, the null hypothesis that the survey unit concentrations do not exceed the LBGR is accepted (i.e., survey unit passes).


Net Gamma Spectrum, Static Location: 1
ROI6 (Ra-226)
ROI5 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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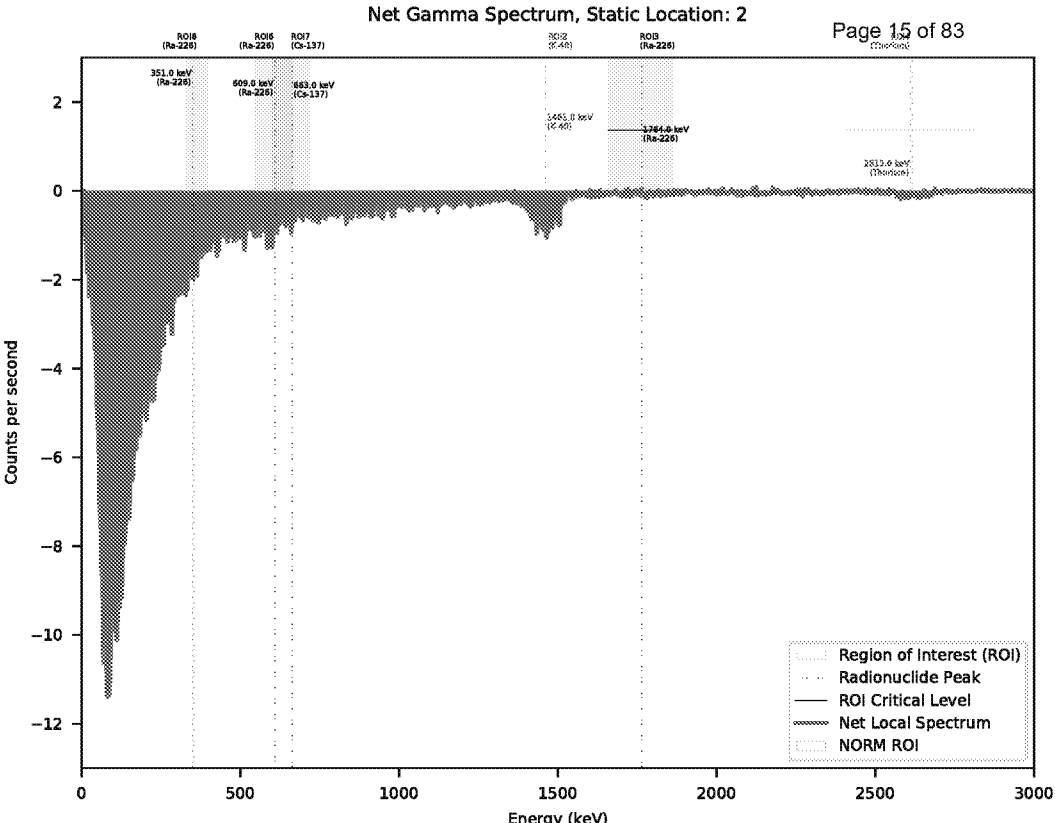
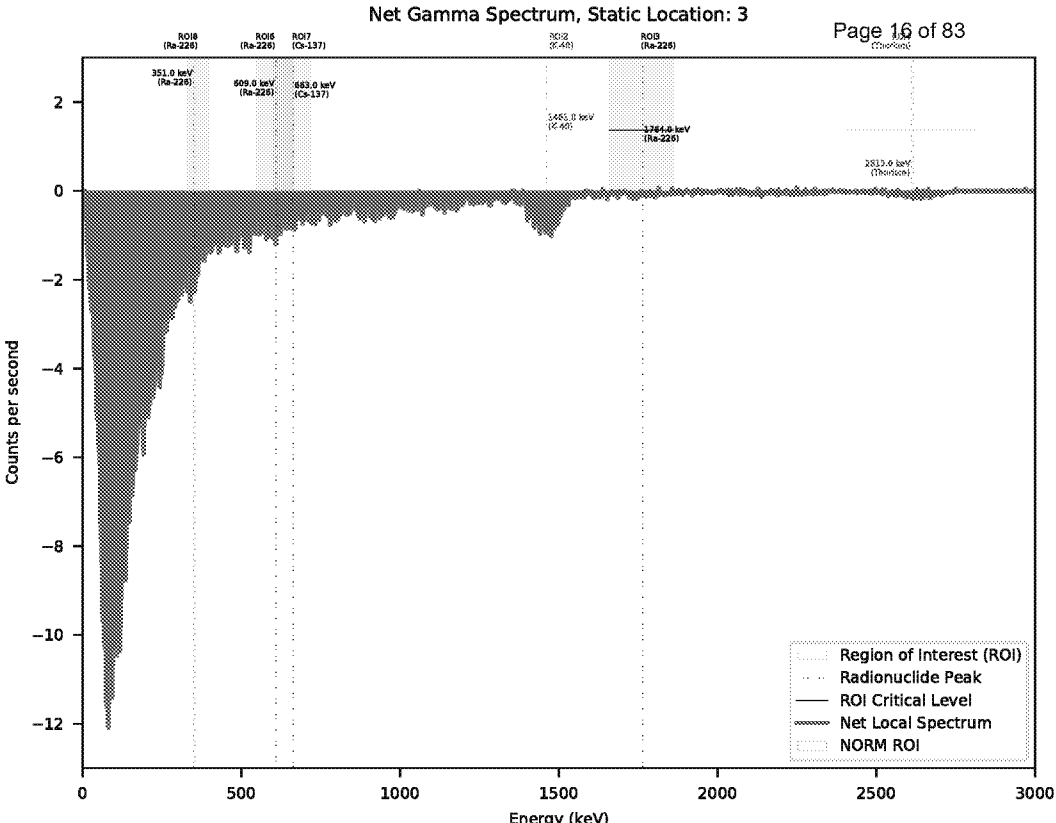

Net Gamma Spectrum, Static Location: 2
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1460.8 keV (K-40)
1764.6 keV (Ra-226)
2613.6 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static4
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36541064482755, 37.72227203676159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ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static4
Background Dataset(s): RSI2_SoilRBA_Static.csv
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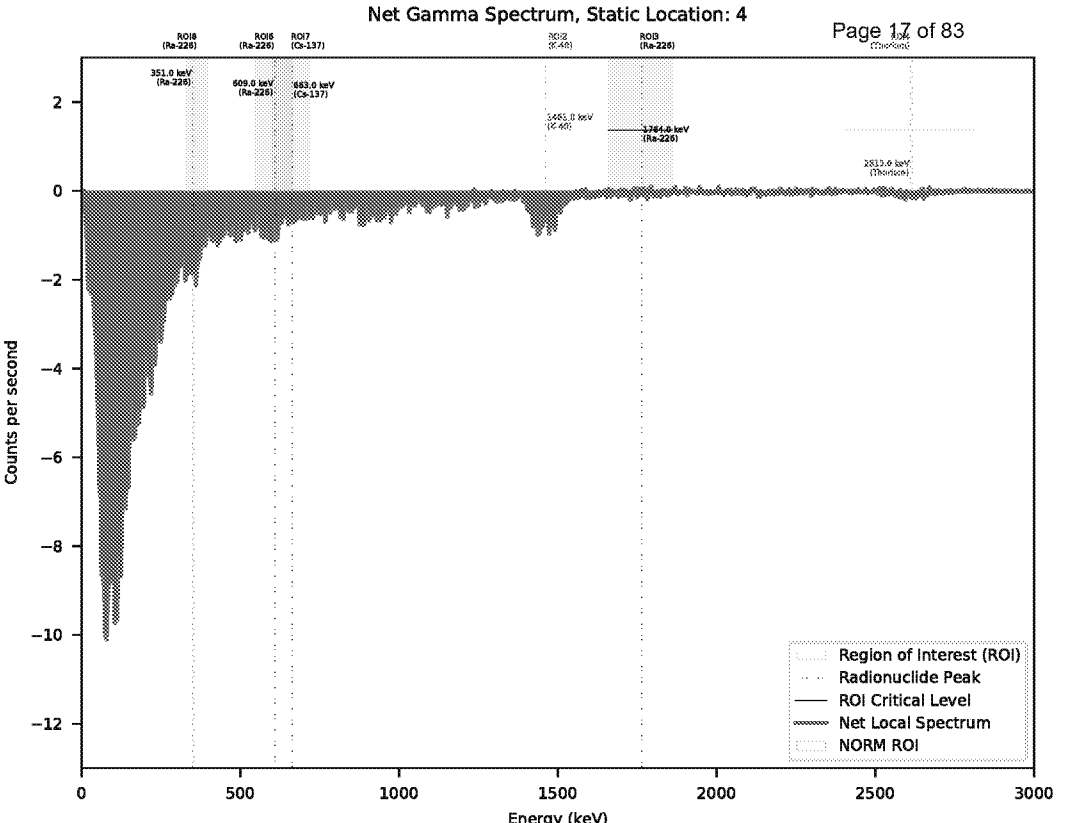
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ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
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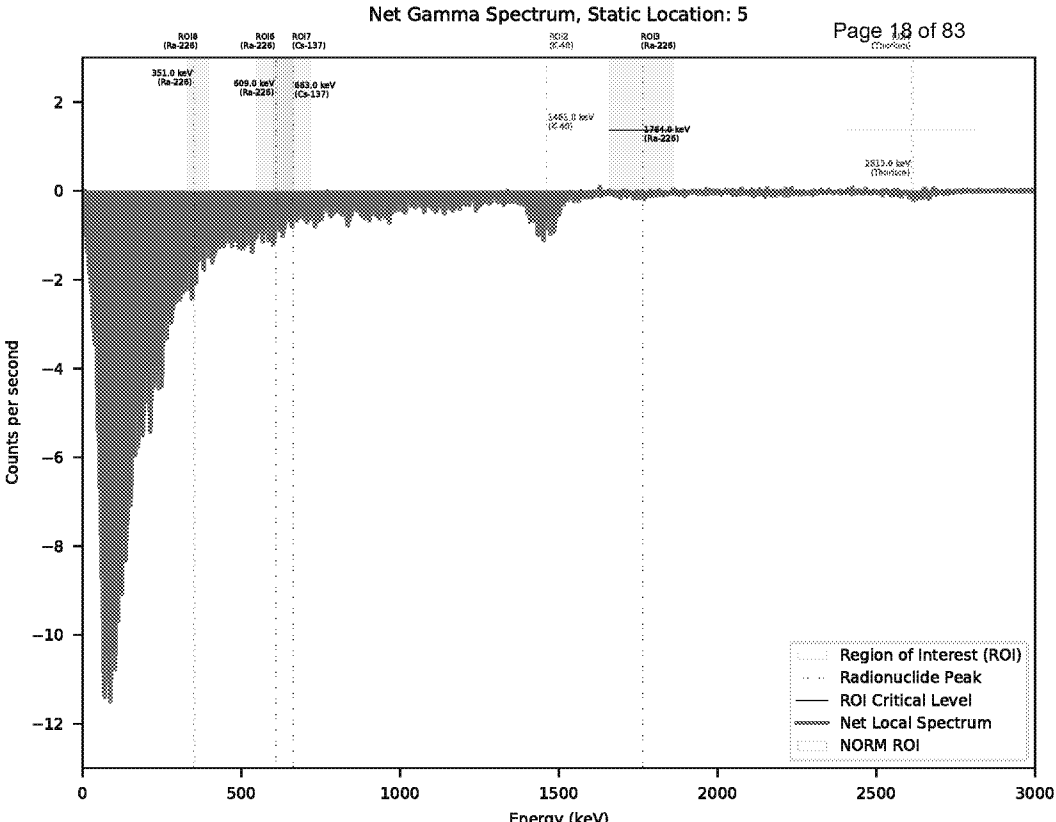
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36527969552239, 37.7222849044776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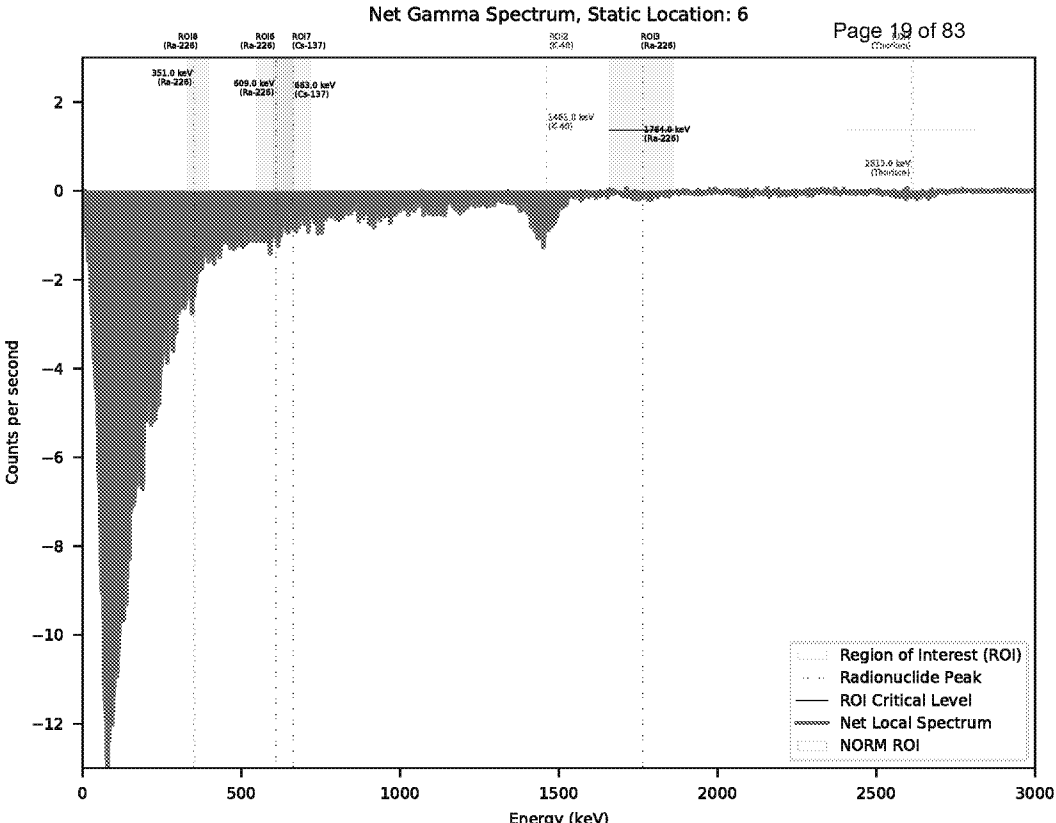
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static4
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36529707777784, 37.72226234583331


Net Gamma Spectrum, Static Location: 6
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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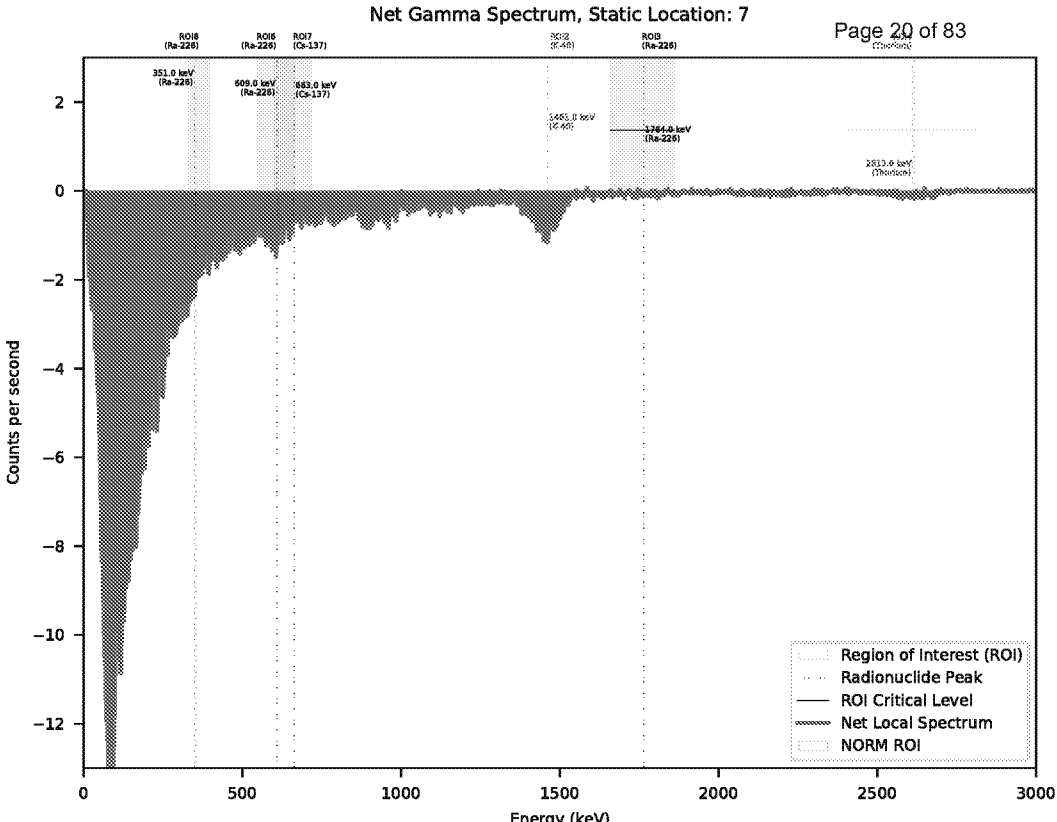
Net Gamma Spectrum, Static Location: 7
ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static4
Background Dataset(s): RSI2_SoilRBA_Static.csv
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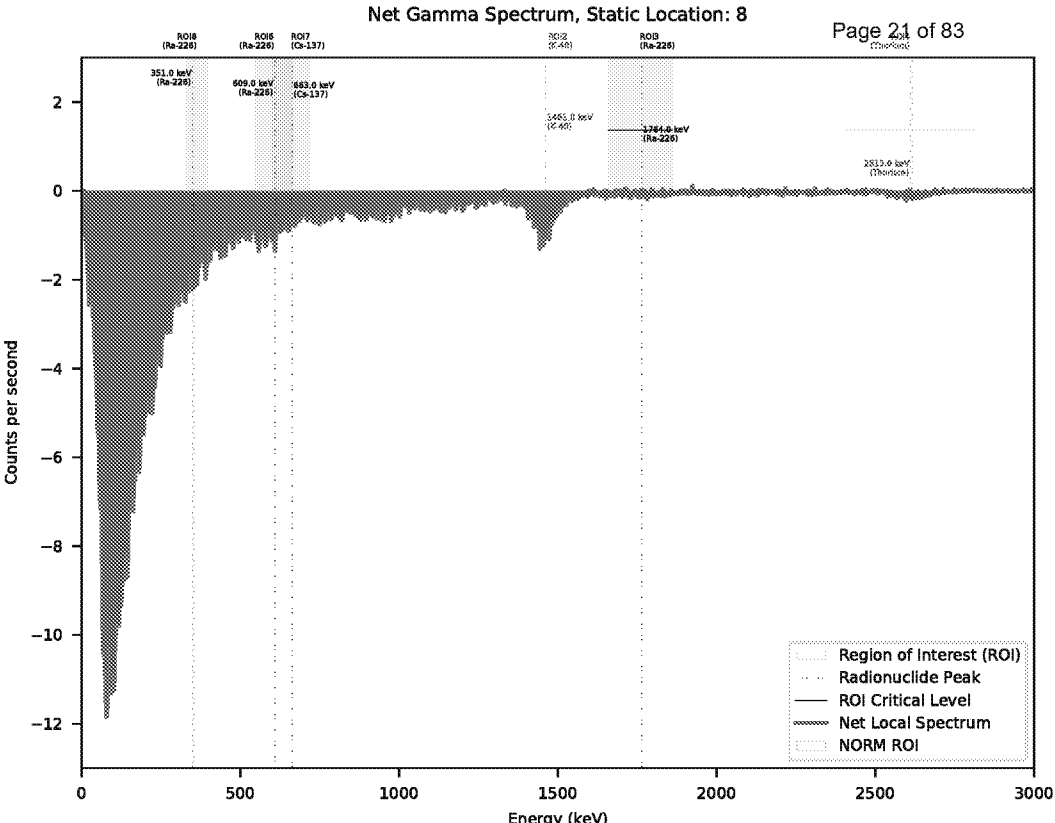
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ROI6 (Ra-226)
ROI5 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Thorium)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Thorium)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static4
Background Dataset(s): RSI2_SoilRBA_Static.csv
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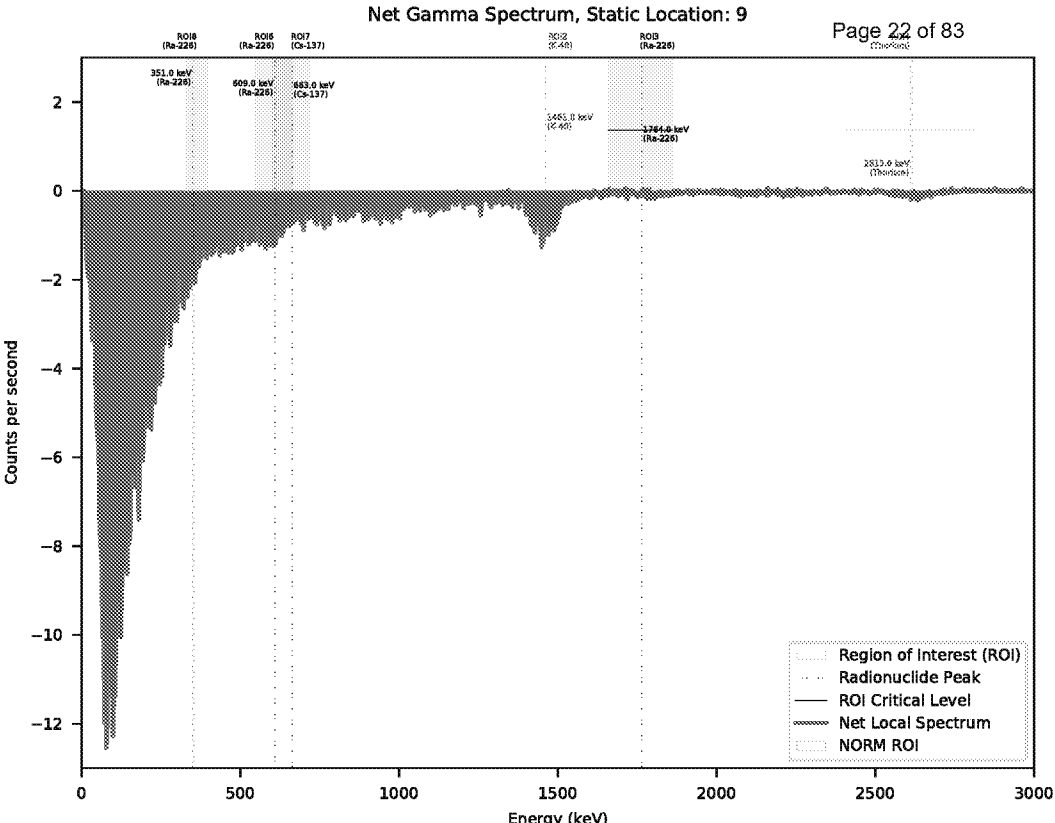
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ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1460.8 keV (K-40)
1764.6 keV (Ra-226)
2613.6 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static4
Background Dataset(s): RSI2_SoilRBA_Static.csv
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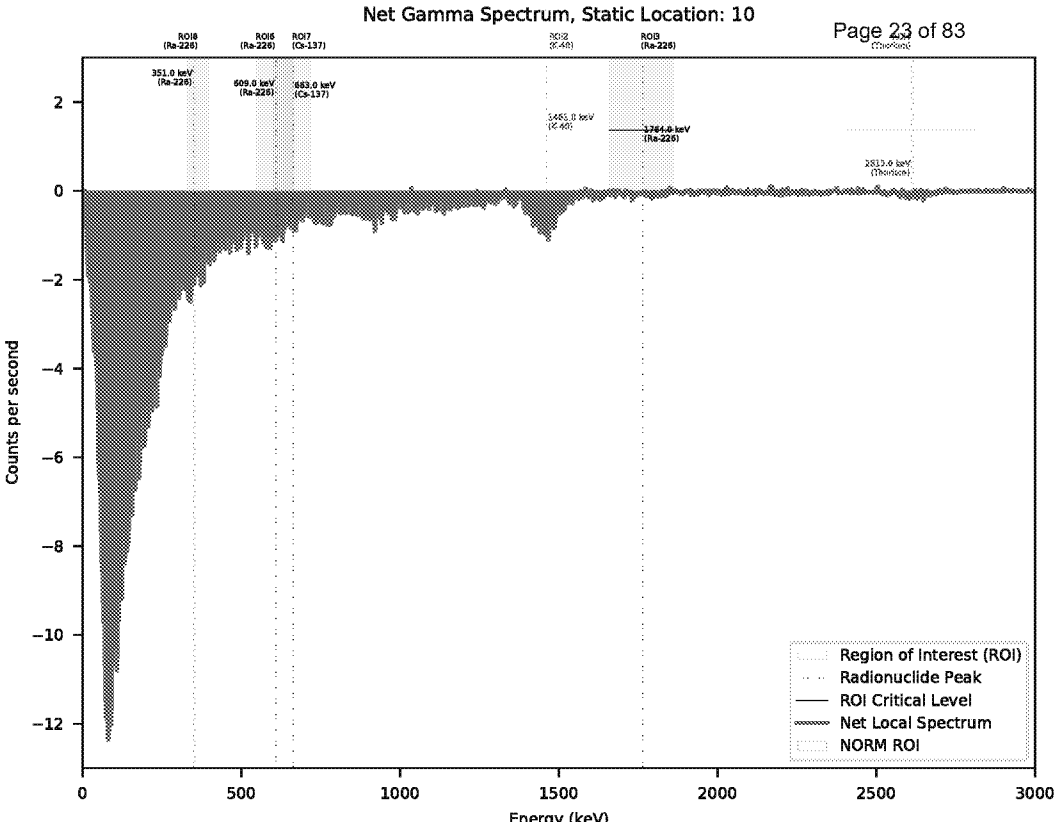
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ROI6 (Ra-226)
ROI5 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI1 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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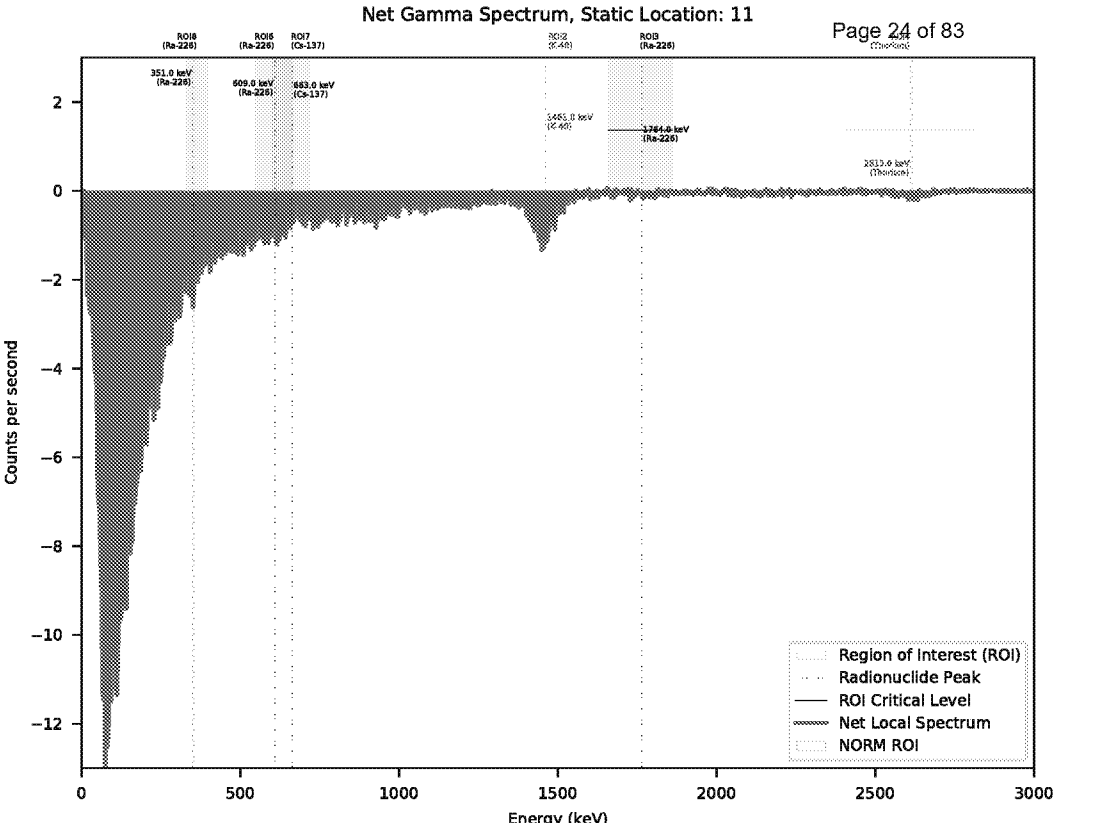
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ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1460.8 keV (K-40)
1764.6 keV (Ra-226)
2613.6 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
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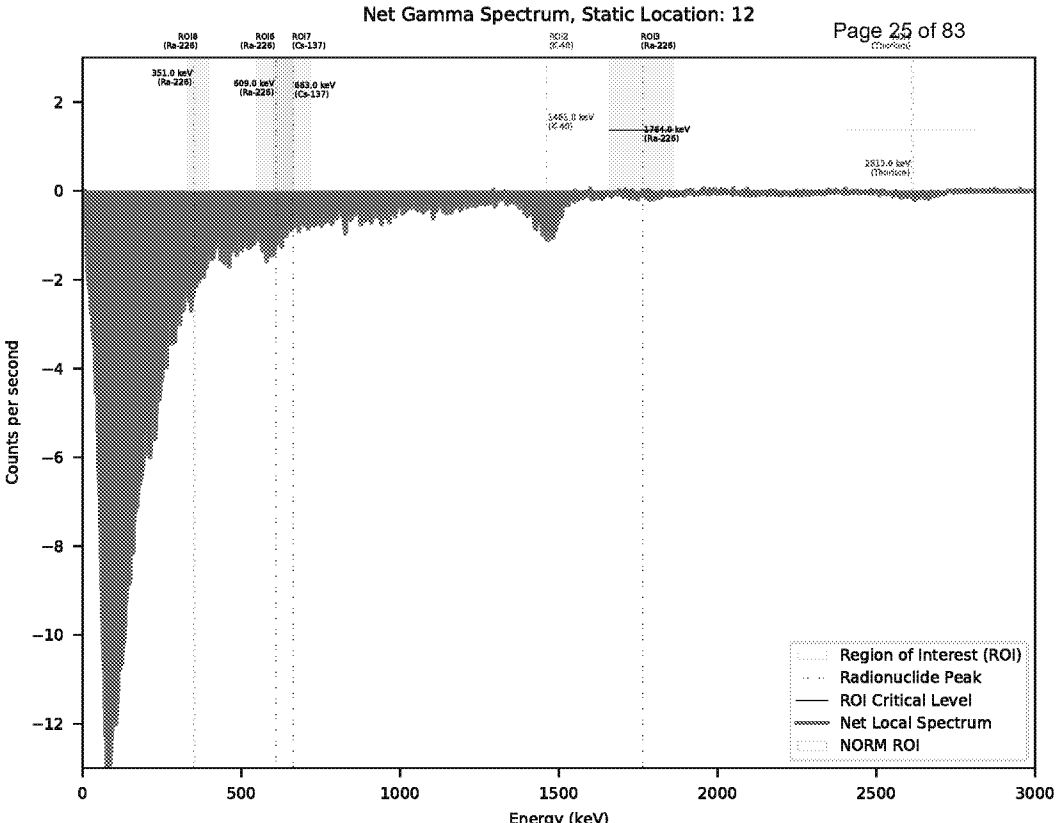
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ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI1 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1460.8 keV (K-40)
1764.6 keV (Ra-226)
2613.6 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
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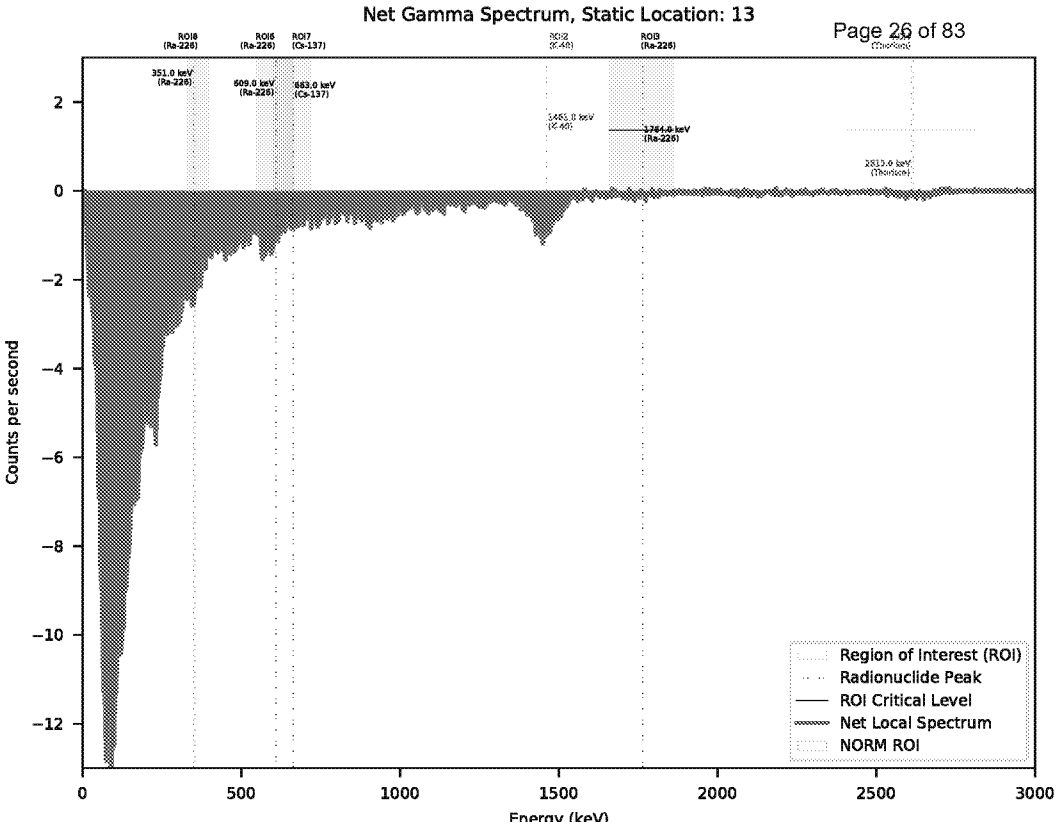
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ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1460.8 keV (K-40)
1764.6 keV (Ra-226)
2613.6 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static\
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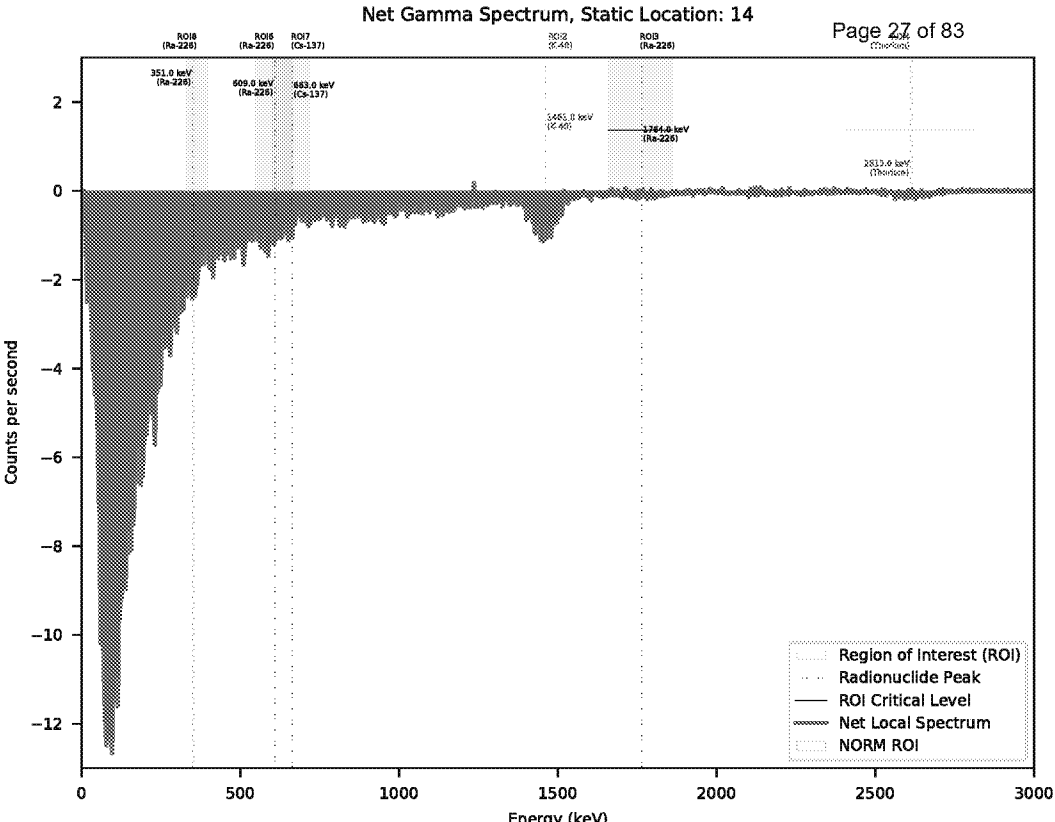
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ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
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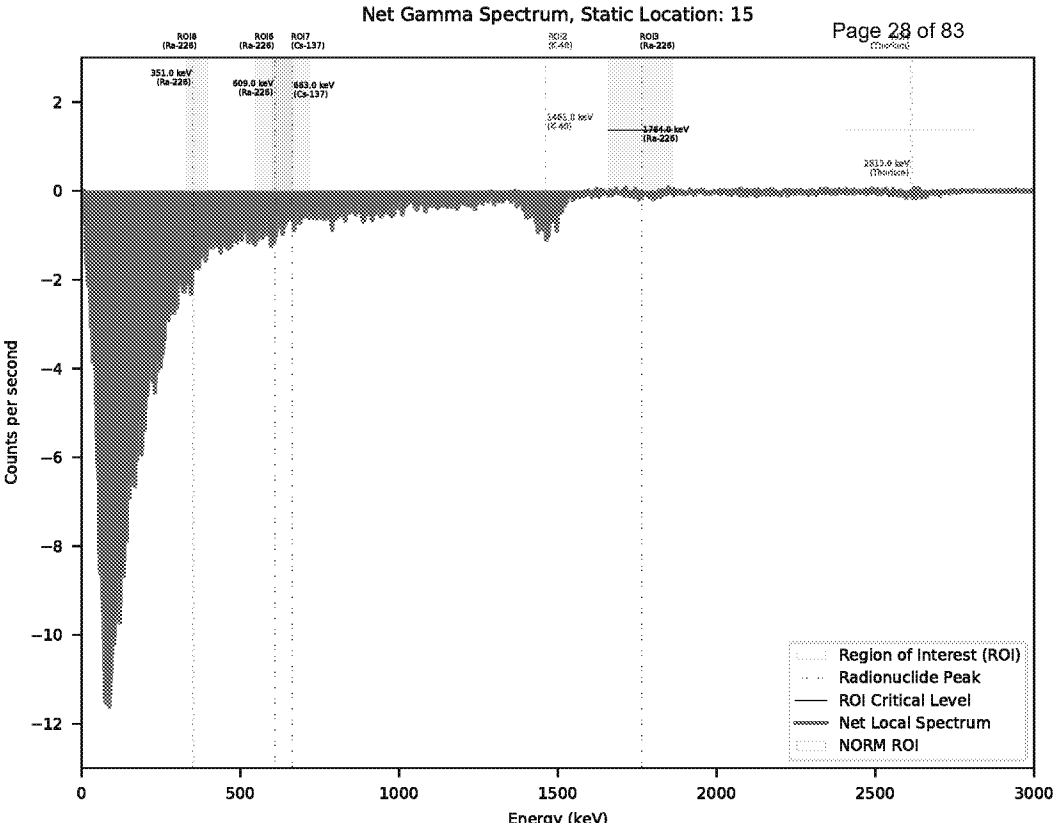
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36528634117642, 37.72219452205885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ROI8 (Ra-226)
ROI6 (Ra-226)
ROI7 (Cs-137)
ROI2 (K-40)
ROI3 (Ra-226)
ROI4 (Th-232)
351.0 keV (Ra-226)
609.0 keV (Ra-226)
683.0 keV (Cs-137)
1455.0 keV (K-40)
1764.0 keV (Ra-226)
2613.0 keV (Th-232)
Counts per second
Energy (keV)
Region of Interest (ROI)
Radionuclide Peak
ROI Critical Level
Net Local Spectrum
NORM ROI
Local Dataset(s): \Static 2020-10-23_1131\static\
Background Dataset(s): RSI2_SoilRBA_Static.csv
Local Coordinates (Longitude, Latitude): -122.36531937222215, 37.722262649999976

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ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40092-1
Laboratory Sample Delivery Group: GJ46599779
Client Project/Site: HPNS-Parcel G 501197
Revision: 1

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/13/2021 2:30:43 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Job ID: 160-40092-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40092-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Additional information requested in case narrative for total strontium

RECEIPT

The samples were received on 10/26/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 13.9 C.

TOTAL BETA STRONTIUM (GFPC)

Samples HPPG-SFU-TU153B-001 (160-40092-3), HPPG-SFU-TU153B-011 (160-40092-13) and HPPG-SFU-TU153B-021 (160-40092-23) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/27/2020,

Job ID: 160-40092-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

prepared on 11/06/2020 and analyzed on 11/26/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-SFU-TU153B-001 (160-40092-3), HPPG-SFU-TU153B-011 (160-40092-13) and HPPG-SFU-TU153B-021 (160-40092-23).

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-488460/24-A)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC PLUTONIUM (ALPHA SPECTROMETRY)
Samples HPPG-SFU-TU153B-001 (160-40092-3), HPPG-SFU-TU153B-011 (160-40092-13) and HPPG-SFU-TU153B-021 (160-40092-23) were analyzed for Isotopic Plutonium (Alpha Spectrometry) in accordance with A-01-R. The samples were dried on 10/27/2020, prepared on 12/15/2020 and analyzed on 12/23/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-491927/1-A)

The results for Pu-238 and Pu-239 are negative more than 3 times the 1-sigma counting uncertainty. This appears to be random/statistical in nature. No further action is needed.HPPG-SFU-TU153B-011 (160-40092-13)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)
Samples HPPG-SFU-TU153B-001 (160-40092-3), HPPG-SFU-TU153B-011 (160-40092-13) and HPPG-SFU-TU153B-021 (160-40092-23) were analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with DOE. The samples were dried on 10/27/2020, prepared on 11/03/2020 and analyzed on 12/03/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-487802/1-A)

Detectors 163-170 were calibrated on 11/6 therefor no monthly calibration verification (ccv) is needed until the the following monthly check which was 12/14 for these detectors. (LCS 160-487802/2-A), (MB 160-487802/1-A), (160-40090-A-1-E) and (160-40090-A-1-F DU)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)
Samples HPPG-F-019 (160-40092-1), HPPG-F-020 (160-40092-2), HPPG-SFU-TU153B-001 (160-40092-3), HPPG-SFU-TU153B-002 (160-40092-4), HPPG-SFU-TU153B-003 (160-40092-5), HPPG-SFU-TU153B-004 (160-40092-6), HPPG-SFU-TU153B-005 (160-40092-7), HPPG-SFU-TU153B-006 (160-40092-8), HPPG-SFU-TU153B-007 (160-40092-9), HPPG-SFU-TU153B-008 (160-40092-10), HPPG-SFU-TU153B-009 (160-40092-11), HPPG-SFU-TU153B-010 (160-40092-12), HPPG-SFU-TU153B-011 (160-40092-13), HPPG-SFU-TU153B-012 (160-40092-14), HPPG-SFU-TU153B-013 (160-40092-15), HPPG-SFU-TU153B-014 (160-40092-16), HPPG-SFU-TU153B-015 (160-40092-17), HPPG-SFU-TU153B-016 (160-40092-18), HPPG-SFU-TU153B-017 (160-40092-19), HPPG-SFU-TU153B-018 (160-40092-20), HPPG-SFU-TU153B-019 (160-40092-21), HPPG-SFU-TU153B-020 (160-40092-22), HPPG-SFU-TU153B-021 (160-40092-23), HPPG-SFU-TU153B-022 (160-40092-24), HPPG-SFU-TU153B-023 (160-40092-25), HPPG-SFU-TU153B-024 (160-40092-26) and HPPG-SFU-TU153B-025 (160-40092-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/27/2020 and 10/28/2020, prepared on 11/02/2020, 11/03/2020 and 11/04/2020 and analyzed on 11/25/2020, 11/26/2020, 12/01/2020 and 12/02/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238

Job ID: 160-40092-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Gamma prep batch 488229
The method blank (MB) z-score associated with Prep Batch 160-488229 is within limits and is stored in the level IV raw data. (MB 160-488229/1-A)

The radium-226 detection goal of 0.2 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. The radium-226 activity in the sample is below to the DLC and RL. (MB 160-488229/1-A)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Th-234: (160-40093-A-15-C DU). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

Gamma prep batch 487748
The method blank (MB) z-score associated with Prep Batch 160-487748 is within limits and is stored in the level IV raw data. (MB 160-487748/1-A)

The replicate precision for Pb-214 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances. (160-40092-A-11-C DU)

The radium-226 detection goal of 0.2 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. The radium-226 activity in the sample is below to the DLC and RL. HPPG-SFU-TU153B-003 (160-40092-5)

Gamma prep batch 488132
The method blank (MB) z-score associated with Prep Batch 160-488132 is within limits and is stored in the level IV raw data. (MB 160-488132/1-A)

The replicate precision for Co-60 associated with Prep Batch 160-487040 and 160-488132 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances. (160-40091-A-23-C DU)

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to

Job ID: 160-40092-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF COUSTODY

Ref. Document # 501197RSY-017

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/23/2020
Waybill Number: 4957 0225 4400
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566

Analysis Requested

Sample ID	Collection Information: Date	Time	Method	Matrix	# of Containers	Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)	Ra-226 by Alpha spec, Isotopic U (234, 235/6, 238)		Isotopic Pu (238, 239/240)	Dose Rate uR/Hr	Evidence Bag ID	Comment
						Preservatives (water)									
						Preservatives (soil)									
HPPG-F-019	10/23/2020	09:54	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-F-020	10/23/2020	10:04	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-001	10/23/2020	09:41	G	SO	1	16 oz. plastic jar	X		X	X		X	4	GJ46599779	
HPPG-SFU-TU153B-002	10/23/2020	09:44	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-003	10/23/2020	09:47	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-004	10/23/2020	09:50	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-005	10/23/2020	09:54	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-006	10/23/2020	09:57	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	

Special Instructions:
21 day ingrowth results only
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g

Turanaround Time: 3-day ☐ 10-Day ☐ 28-day ☐ Other ☐

Level of QC Required: I | II | III | Project Specific

Method Codes C = Composite G = Grab **Matrix Codes:** DW = Drinking Water ; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air ; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin	[signature]	10/23/2020 14:28	SHIPPEDTOLAB VIA FE	Michael Kerinhing	10/26/2020 08:38

***** Last 3 transfers shown above - Complete list of transfers on last page *****

160-40092 Chain of Custody

Page 7 of 38

4/13/2021 (Rev. 1)

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-017

APTIM Federal Services, LLC
4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Cordit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 10/23/2020
Waybill Number: 4957 0225 4400
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046
Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

	Collection Information					Preservatives (water)	Analysis Requested								
						Preservatives (soil)	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)	Ra-226 by Alpha spec, Isotopic U(234, 235/6, 238)		Isotopic Pu (238, 239/240)	Dose Rate uR/Hr	Evidence Bag ID	Comment
Sample ID	Date	Time	Method	Matrix	# of Containers	Container Type									
HPPG-SFU-TU153B-007	10/23/2020	10:01	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-008	10/23/2020	10:04	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-009	10/23/2020	10:04	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-010	10/23/2020	10:08	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-011	10/23/2020	10:11	G	SO	1	16 oz. plastic jar	X		X	X		X	4	GJ46599779	
HPPG-SFU-TU153B-012	10/23/2020	10:15	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-013	10/23/2020	10:18	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-014	10/23/2020	10:22	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-015	10/23/2020	10:26	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-016	10/23/2020	10:28	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-017	10/23/2020	10:31	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-018	10/23/2020	10:34	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-019	10/23/2020	10:37	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-020	10/23/2020	10:41	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-021	10/23/2020	10:44	G	SO	1	16 oz. plastic jar	X		X	X		X	4	GJ46599779	
HPPG-SFU-TU153B-022	10/23/2020	10:47	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-023	10/23/2020	10:50	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-017

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4005 Port Chicago Hwy
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Project Manager: Lisa Bercik
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Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

	Collection Information						Analysis Requested								
Sample ID	Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)	Ra-226 by Alpha spec, Isotopic U(234, 235/6, 238)		Isotopic Pu (238, 239/240)	Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-SFU-TU153B-024	10/23/2020	10:54	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	
HPPG-SFU-TU153B-025	10/23/2020	10:57	G	SO	1	16 oz. plastic jar	X						4	GJ46599779	

All Transfers for COC 501197RSY-017

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin	[signature]	10/23/2020 14:28	SHIPPEDTOLAB Via FE	[signature]	10/24/2020 08:38

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40092-1
SDG Number: GJ46599779

Login Number: 40092
List Number: 1
Creator: Korrinhizer, Micha L

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40092-1
SDG: GJ46599779

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40092-1
SDG: GJ46599779

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40092-1	HPPG-F-019	Solid	10/23/20 09:54	10/26/20 08:38	
160-40092-2	HPPG-F-020	Solid	10/23/20 10:04	10/26/20 08:38	
160-40092-3	HPPG-SFU-TU153B-001	Solid	10/23/20 09:41	10/26/20 08:38	
160-40092-4	HPPG-SFU-TU153B-002	Solid	10/23/20 09:44	10/26/20 08:38	
160-40092-5	HPPG-SFU-TU153B-003	Solid	10/23/20 09:47	10/26/20 08:38	
160-40092-6	HPPG-SFU-TU153B-004	Solid	10/23/20 09:50	10/26/20 08:38	
160-40092-7	HPPG-SFU-TU153B-005	Solid	10/23/20 09:54	10/26/20 08:38	
160-40092-8	HPPG-SFU-TU153B-006	Solid	10/23/20 09:57	10/26/20 08:38	
160-40092-9	HPPG-SFU-TU153B-007	Solid	10/23/20 10:01	10/26/20 08:38	
160-40092-10	HPPG-SFU-TU153B-008	Solid	10/23/20 10:04	10/26/20 08:38	
160-40092-11	HPPG-SFU-TU153B-009	Solid	10/23/20 10:04	10/26/20 08:38	
160-40092-12	HPPG-SFU-TU153B-010	Solid	10/23/20 10:08	10/26/20 08:38	
160-40092-13	HPPG-SFU-TU153B-011	Solid	10/23/20 10:11	10/26/20 08:38	
160-40092-14	HPPG-SFU-TU153B-012	Solid	10/23/20 10:15	10/26/20 08:38	
160-40092-15	HPPG-SFU-TU153B-013	Solid	10/23/20 10:18	10/26/20 08:38	
160-40092-16	HPPG-SFU-TU153B-014	Solid	10/23/20 10:22	10/26/20 08:38	
160-40092-17	HPPG-SFU-TU153B-015	Solid	10/23/20 10:26	10/26/20 08:38	
160-40092-18	HPPG-SFU-TU153B-016	Solid	10/23/20 10:28	10/26/20 08:38	
160-40092-19	HPPG-SFU-TU153B-017	Solid	10/23/20 10:31	10/26/20 08:38	
160-40092-20	HPPG-SFU-TU153B-018	Solid	10/23/20 10:34	10/26/20 08:38	
160-40092-21	HPPG-SFU-TU153B-019	Solid	10/23/20 10:37	10/26/20 08:38	
160-40092-22	HPPG-SFU-TU153B-020	Solid	10/23/20 10:41	10/26/20 08:38	
160-40092-23	HPPG-SFU-TU153B-021	Solid	10/23/20 10:44	10/26/20 08:38	
160-40092-24	HPPG-SFU-TU153B-022	Solid	10/23/20 10:47	10/26/20 08:38	
160-40092-25	HPPG-SFU-TU153B-023	Solid	10/23/20 10:50	10/26/20 08:38	
160-40092-26	HPPG-SFU-TU153B-024	Solid	10/23/20 10:54	10/26/20 08:38	
160-40092-27	HPPG-SFU-TU153B-025	Solid	10/23/20 10:57	10/26/20 08:38	

Client Sample ID: HPPG-F-019

Lab Sample ID: 160-40092-1

Date Collected: 10/23/20 09:54
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.0831	U	0.655	0.655		0.404	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Actinium 228	**0.156**		0.250	0.251		0.144	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Bismuth-212	0.314	U	0.789	0.790		0.618	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Bismuth-214	**0.334**		0.107	0.114		0.0374	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Cesium-137	0.0203	U	0.0522	0.0523	0.0700	0.0404	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Lead-210	0.813	U	1.59	1.60		1.01	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Lead-212	**0.309**		0.0909	0.0979		0.0512	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Lead-214	**0.327**		0.104	0.111		0.0487	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Potassium-40	**7.51**		1.35	1.60		0.277	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Protactinium-231	-0.909	U	3.03	3.03		2.47	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Protactinium-234	0.0743	U	0.219	0.220		0.260	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Radium-226	**0.334**		0.107	0.114	0.200	0.0374	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Radium-228	**0.156**		0.250	0.251		0.144	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Thallium-208	**0.111**		0.0617	0.0630		0.0288	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Thorium-232	**0.156**		0.250	0.251		0.144	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Thorium-234	0.316	U	0.454	0.456		0.440	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Thorium 228	**0.309**		0.0909	0.0979		0.0512	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Uranium-235	-0.117	U	0.220	0.221		0.532	pCi/g	11/02/20 17:57	11/26/20 11:43	1
Uranium-238	0.316	U	0.454	0.456		0.440	pCi/g	11/02/20 17:57	11/26/20 11:43	1

Client Sample ID: HPPG-F-020

Lab Sample ID: 160-40092-2

Date Collected: 10/23/20 10:04
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.199	U	0.596	0.597		0.363	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Actinium 228	0.0793	U	0.179	0.180		0.119	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Bismuth-212	0.268	U	0.574	0.574		0.443	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Bismuth-214	**0.257**		0.0816	0.0858		0.0277	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Cesium-137	-0.00553	U	0.0518	0.0518	0.0700	0.0421	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Lead-210	**0.753**		1.02	1.03		0.721	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Lead-212	**0.380**		0.0798	0.0937		0.0361	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Lead-214	**0.327**		0.0850	0.0915		0.0522	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Potassium-40	**7.82**		1.22	1.46		0.269	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Protactinium-231	0.266	U	1.24	1.24		1.93	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Protactinium-234	0.107	U	0.208	0.208		0.142	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Radium-226	**0.257**		0.0816	0.0858	0.200	0.0277	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Radium-228	0.0793	U	0.179	0.180		0.119	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thallium-208	**0.113**		0.0508	0.0522		0.0235	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thorium-232	0.0793	U	0.179	0.180		0.119	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thorium-234	-0.102	U	0.560	0.560		0.464	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thorium 228	**0.380**		0.0798	0.0937		0.0361	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Uranium-235	0.0469	U	0.333	0.333		0.272	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Uranium-238	-0.102	U	0.560	0.560		0.464	pCi/g	11/02/20 17:57	11/26/20 11:52	1

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40092-1
SDG: GJ46599779

Client Sample ID: HPPG-SFU-TU153B-001

Date Collected: 10/23/20 09:41
Date Received: 10/26/20 08:38

Lab Sample ID: 160-40092-3

Matrix: Solid

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.0336	U	0.0642	0.0642	0.160	0.0554	pCi/g	11/06/20 11:01	11/26/20 10:44	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*88.8*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:44*	*1*

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.00215	U	0.0114	0.0114	0.100	0.00868	pCi/g	12/15/20 12:11	12/23/20 14:28	1
Plutonium-239/240	-0.00216	U	0.0114	0.0114	0.100	0.0100	pCi/g	12/15/20 12:11	12/23/20 14:28	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Pu-242 (T)	*99.0*		*30 - 110*	*12/15/20 12:11*	*12/23/20 14:28*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-234	**0.606**		0.0749	0.0906	0.250	0.0116	pCi/g	11/03/20 12:03	12/03/20 16:16	1
Uranium-235/236	**0.0389**		0.0208	0.0211	0.100	0.00647	pCi/g	11/03/20 12:03	12/03/20 16:16	1
Uranium-238	**0.665**		0.0770	0.0951	0.250	0.00519	pCi/g	11/03/20 12:03	12/03/20 16:16	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*79.2*		*30 - 110*	*11/03/20 12:03*	*12/03/20 16:16*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.363	U	0.774	0.775		0.468	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Actinium 228	**0.463**		0.237	0.242		0.0881	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Bismuth-212	-0.119	U	0.678	0.678		0.543	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Bismuth-214	**0.421**		0.131	0.138		0.0476	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Cesium-137	-0.0244	U	0.0787	0.0787	0.0700	0.0561	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Lead-210	0.516	U	0.839	0.841		0.590	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Lead-212	**0.334**		0.0908	0.101		0.0474	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Lead-214	**0.338**		0.118	0.123		0.0533	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Potassium-40	**6.77**		1.39	1.56		0.263	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Protactinium-231	0.000	U	0.600	0.600		1.87	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Protactinium-234	0.0631	U	0.166	0.166		0.133	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Radium-226	**0.421**		0.131	0.138	0.200	0.0476	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Radium-228	**0.463**		0.237	0.242		0.0881	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thallium-208	0.0402	U	0.0801	0.0802		0.0419	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thorium-232	**0.463**		0.237	0.242		0.0881	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thorium-234	**0.659**		0.516	0.521		0.337	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Thorium 228	**0.334**		0.0908	0.101		0.0474	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Uranium-235	0.151	U	0.123	0.124		0.276	pCi/g	11/02/20 17:57	11/26/20 11:52	1
Uranium-238	**0.659**		0.516	0.521		0.337	pCi/g	11/02/20 17:57	11/26/20 11:52	1

Client Sample ID: HPPG-SFU-TU153B-002

Lab Sample ID: 160-40092-4

Date Collected: 10/23/20 09:44
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.126	U	0.281	0.281		0.292	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Actinium 228	**0.315**		0.148	0.151		0.100	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Bismuth-212	**0.763**		0.352	0.361		0.127	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Bismuth-214	**0.355**		0.116	0.122		0.0484	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Cesium-137	0.00132	U	0.0542	0.0542	0.0700	0.0445	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Lead-210	-0.674	U	1.49	1.49		1.20	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Lead-212	**0.362**		0.0769	0.0900		0.0380	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Lead-214	**0.300**		0.0834	0.0890		0.0442	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Potassium-40	**7.91**		1.17	1.43		0.263	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Protactinium-231	0.000	U	0.532	0.532		1.95	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Protactinium-234	0.0970	U	0.203	0.203		0.169	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Radium-226	**0.355**		0.116	0.122	0.200	0.0484	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Radium-228	**0.315**		0.148	0.151		0.100	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Thallium-208	**0.160**		0.0444	0.0474		0.0124	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Thorium-232	**0.315**		0.148	0.151		0.100	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Thorium-234	-0.356	U	0.464	0.466		0.958	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Thorium 228	**0.362**		0.0769	0.0900		0.0380	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Uranium-235	0.0885	U	0.182	0.183		0.328	pCi/g	11/02/20 17:57	11/26/20 11:55	1
Uranium-238	-0.356	U	0.464	0.466		0.958	pCi/g	11/02/20 17:57	11/26/20 11:55	1

Client Sample ID: HPPG-SFU-TU153B-003

Lab Sample ID: 160-40092-5

Date Collected: 10/23/20 09:47
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0354	U	0.136	0.136		0.391	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Actinium 228	**0.147**		0.218	0.219		0.142	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Bismuth-212	-0.303	U	0.755	0.756		0.592	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Bismuth-214	0.125	U	0.0791	0.0802		0.212	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Cesium-137	0.0269	U	0.0468	0.0469	0.0700	0.0349	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Lead-210	0.698	U	1.35	1.36		0.984	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Lead-212	**0.337**		0.0793	0.0867		0.0345	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Lead-214	**0.343**		0.109	0.114		0.0566	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Potassium-40	**9.27**		1.40	1.68		0.123	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Protactinium-231	-0.845	U	2.77	2.77		2.25	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Protactinium-234	0.0889	U	0.270	0.270		0.219	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Radium-226	0.125	U	0.0791	0.0802	0.200	0.212	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Radium-228	**0.147**		0.218	0.219		0.142	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Thallium-208	**0.161**		0.0567	0.0591		0.0164	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Thorium-232	**0.147**		0.218	0.219		0.142	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Thorium-234	-0.587	U	0.641	0.644		0.852	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Thorium 228	**0.337**		0.0793	0.0867		0.0345	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Uranium-235	0.0909	U	0.194	0.194		0.416	pCi/g	11/02/20 17:57	11/26/20 11:56	1
Uranium-238	-0.587	U	0.641	0.644		0.852	pCi/g	11/02/20 17:57	11/26/20 11:56	1

Client Sample ID: HPPG-SFU-TU153B-004

Lab Sample ID: 160-40092-6

Date Collected: 10/23/20 09:50
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.315	U	0.603	0.604		0.349	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Actinium 228	**0.479**		0.138	0.147		0.0232	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Bismuth-212	0.363	U	0.691	0.692		0.540	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Bismuth-214	**0.299**		0.0936	0.0986		0.0489	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Cesium-137	-0.0240	U	0.0484	0.0485	0.0700	0.0376	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Lead-210	-0.710	U	1.29	1.29		1.03	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Lead-212	**0.371**		0.0699	0.0848		0.0280	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Lead-214	**0.420**		0.0892	0.0993		0.0425	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Potassium-40	**7.74**		1.10	1.36		0.0916	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Protactinium-231	0.129	U	1.14	1.14		1.76	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Protactinium-234	-0.0927	U	0.260	0.260		0.212	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Radium-226	**0.299**		0.0936	0.0986	0.200	0.0489	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Radium-228	**0.479**		0.138	0.147		0.0232	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Thallium-208	**0.127**		0.0390	0.0411		0.00983	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Thorium-232	**0.479**		0.138	0.147		0.0232	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Thorium-234	-0.344	U	1.04	1.04		0.849	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Thorium 228	**0.371**		0.0699	0.0848		0.0280	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Uranium-235	-0.173	U	0.497	0.497		0.405	pCi/g	11/02/20 17:57	11/26/20 11:58	1
Uranium-238	-0.344	U	1.04	1.04		0.849	pCi/g	11/02/20 17:57	11/26/20 11:58	1

Client Sample ID: HPPG-SFU-TU153B-005

Lab Sample ID: 160-40092-7

Date Collected: 10/23/20 09:54
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.00312	U	0.00656	0.00657		0.389	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Actinium 228	**0.380**		0.268	0.271		0.118	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Bismuth-212	0.0247	U	0.889	0.889		0.730	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Bismuth-214	**0.411**		0.137	0.144		0.0543	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Cesium-137	0.0385	U	0.0699	0.0700	0.0700	0.0537	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Lead-210	-0.324	U	1.85	1.85		1.53	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Lead-212	**0.234**		0.129	0.133		0.0651	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Lead-214	**0.380**		0.139	0.144		0.0861	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Potassium-40	**7.17**		1.35	1.54		0.149	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Protactinium-231	0.653	U	2.31	2.31		1.87	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Protactinium-234	-0.127	U	0.336	0.337		0.273	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Radium-226	**0.411**		0.137	0.144	0.200	0.0543	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Radium-228	**0.380**		0.268	0.271		0.118	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Thallium-208	**0.116**		0.0953	0.0960		0.0365	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Thorium-232	**0.380**		0.268	0.271		0.118	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Thorium-234	-0.509	U	0.832	0.833		1.10	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Thorium 228	**0.234**		0.129	0.133		0.0651	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Uranium-235	-0.239	U	0.443	0.443		0.467	pCi/g	11/02/20 17:57	11/26/20 12:00	1
Uranium-238	-0.509	U	0.832	0.833		1.10	pCi/g	11/02/20 17:57	11/26/20 12:00	1

Client Sample ID: HPPG-SFU-TU153B-006

Lab Sample ID: 160-40092-8

Date Collected: 10/23/20 09:57
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0238	U	0.0622	0.0623		0.353	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Actinium 228	**0.218**		0.129	0.131		0.104	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Bismuth-212	-0.389	U	0.842	0.843		0.664	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Bismuth-214	**0.274**		0.126	0.129		0.0572	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Cesium-137	-0.0164	U	0.0645	0.0646	0.0700	0.0518	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Lead-210	**1.44**		1.29	1.30		0.805	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Lead-212	**0.336**		0.0795	0.0906		0.0386	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Lead-214	**0.392**		0.0952	0.104		0.0406	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Potassium-40	**5.87**		1.10	1.25		0.280	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Protactinium-231	0.541	U	1.69	1.69		1.85	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Protactinium-234	-0.0345	U	0.0972	0.0972		0.212	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Radium-226	**0.274**		0.126	0.129	0.200	0.0572	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Radium-228	**0.218**		0.129	0.131		0.104	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Thallium-208	**0.0902**		0.0640	0.0646		0.0282	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Thorium-232	**0.218**		0.129	0.131		0.104	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Thorium-234	0.102	U	0.479	0.479		0.385	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Thorium 228	**0.336**		0.0795	0.0906		0.0386	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Uranium-235	-0.0173	U	0.0329	0.0330		0.394	pCi/g	11/02/20 17:57	11/26/20 12:02	1
Uranium-238	0.102	U	0.479	0.479		0.385	pCi/g	11/02/20 17:57	11/26/20 12:02	1

Client Sample ID: HPPG-SFU-TU153B-007

Lab Sample ID: 160-40092-9

Date Collected: 10/23/20 10:01
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0107	U	0.557	0.557		0.347	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Actinium 228	**0.572**		0.154	0.164		0.0364	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Bismuth-212	0.000	U	0.140	0.140		0.587	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Bismuth-214	**0.188**		0.113	0.114		0.153	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Cesium-137	0.0248	U	0.0546	0.0546	0.0700	0.0417	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Lead-210	-0.777	U	1.47	1.48		1.25	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Lead-212	**0.302**		0.0737	0.0802		0.0328	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Lead-214	**0.293**		0.0908	0.0955		0.0439	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Potassium-40	**6.99**		1.37	1.54		0.226	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Protactinium-231	0.000	U	0.371	0.371		2.13	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Protactinium-234	0.0426	U	0.0839	0.0840		0.226	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Radium-226	**0.188**		0.113	0.114	0.200	0.153	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Radium-228	**0.572**		0.154	0.164		0.0364	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Thallium-208	**0.125**		0.0575	0.0588		0.0227	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Thorium-232	**0.572**		0.154	0.164		0.0364	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Thorium-234	-0.934	U	0.665	0.673		0.739	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Thorium 228	**0.302**		0.0737	0.0802		0.0328	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Uranium-235	0.0800	U	0.379	0.379		0.341	pCi/g	11/02/20 17:57	11/26/20 12:52	1
Uranium-238	-0.934	U	0.665	0.673		0.739	pCi/g	11/02/20 17:57	11/26/20 12:52	1

Client Sample ID: HPPG-SFU-TU153B-008

Lab Sample ID: 160-40092-10

Date Collected: 10/23/20 10:04
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.117	U	0.317	0.318		0.270	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Actinium 228	**0.136**		0.167	0.167		0.0970	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Bismuth-212	-0.205	U	0.736	0.736		0.590	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Bismuth-214	**0.325**		0.118	0.123		0.0454	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Cesium-137	0.00987	U	0.0602	0.0602	0.0700	0.0488	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Lead-210	**1.32**		1.23	1.24		0.784	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Lead-212	**0.246**		0.0750	0.0814		0.0445	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Lead-214	**0.250**		0.0850	0.0889		0.0759	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Potassium-40	**7.06**		1.12	1.34		0.251	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Protactinium-231	-0.100	U	2.29	2.29		1.88	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Protactinium-234	0.0410	U	0.0887	0.0888		0.137	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Radium-226	**0.325**		0.118	0.123	0.200	0.0454	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Radium-228	**0.136**		0.167	0.167		0.0970	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Thallium-208	**0.0753**		0.0896	0.0899		0.0388	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Thorium-232	**0.136**		0.167	0.167		0.0970	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Thorium-234	**0.957**		0.519	0.530		0.275	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Thorium 228	**0.246**		0.0750	0.0814		0.0445	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Uranium-235	-0.0493	U	0.204	0.204		0.216	pCi/g	11/02/20 17:57	11/26/20 12:48	1
Uranium-238	**0.957**		0.519	0.530		0.275	pCi/g	11/02/20 17:57	11/26/20 12:48	1

Client Sample ID: HPPG-SFU-TU153B-009

Lab Sample ID: 160-40092-11

Date Collected: 10/23/20 10:04
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0604	U	0.0937	0.0939		0.387	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Actinium 228	**0.411**		0.163	0.170		0.0642	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Bismuth-212	0.375	U	0.779	0.780		0.600	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Bismuth-214	**0.290**		0.133	0.137		0.0595	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Cesium-137	-0.0246	U	0.0722	0.0723	0.0700	0.0458	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Lead-210	-2.61	U	1.62	1.65		1.98	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Lead-212	**0.308**		0.112	0.118		0.0565	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Lead-214	0.0295	U	0.142	0.142		0.115	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Potassium-40	**7.84**		1.53	1.77		0.410	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Protactinium-231	0.0000000159	U	2.91	2.91		2.40	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Protactinium-234	-0.118	U	0.351	0.352		0.286	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Radium-226	**0.290**		0.133	0.137	0.200	0.0595	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Radium-228	**0.411**		0.163	0.170		0.0642	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Thallium-208	**0.103**		0.0574	0.0586		0.0270	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Thorium-232	**0.411**		0.163	0.170		0.0642	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Thorium-234	**0.700**		0.659	0.665		0.453	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Thorium 228	**0.308**		0.112	0.118		0.0565	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Uranium-235	0.242	U	0.210	0.212		0.528	pCi/g	11/02/20 17:57	11/26/20 12:24	1
Uranium-238	**0.700**		0.659	0.665		0.453	pCi/g	11/02/20 17:57	11/26/20 12:24	1

Client Sample ID: HPPG-SFU-TU153B-010

Lab Sample ID: 160-40092-12

Date Collected: 10/23/20 10:08
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.162	U	0.359	0.359		0.345	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Actinium 228	**0.436**		0.168	0.174		0.0853	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Bismuth-212	0.360	U	0.721	0.722		0.550	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Bismuth-214	0.177	U	0.123	0.125		0.195	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Cesium-137	0.00515	U	0.0581	0.0581	0.0700	0.0469	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Lead-210	-0.0677	U	1.19	1.19		0.849	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Lead-212	**0.236**		0.0758	0.0817		0.0400	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Lead-214	**0.365**		0.116	0.122		0.0606	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Potassium-40	**7.02**		1.39	1.57		0.255	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Protactinium-231	0.342	U	1.48	1.48		1.94	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Protactinium-234	0.0437	U	0.212	0.212		0.142	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Radium-226	0.177	U	0.123	0.125	0.200	0.195	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Radium-228	**0.436**		0.168	0.174		0.0853	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Thallium-208	**0.182**		0.0538	0.0571		0.00891	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Thorium-232	**0.436**		0.168	0.174		0.0853	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Thorium-234	0.107	U	0.231	0.231		0.718	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Thorium 228	**0.236**		0.0758	0.0817		0.0400	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Uranium-235	-0.0229	U	0.0341	0.0341		0.280	pCi/g	11/03/20 18:38	12/01/20 23:09	1
Uranium-238	0.107	U	0.231	0.231		0.718	pCi/g	11/03/20 18:38	12/01/20 23:09	1

Client Sample ID: HPPG-SFU-TU153B-011

Lab Sample ID: 160-40092-13

Date Collected: 10/23/20 10:11
Matrix: Solid
Date Received: 10/26/20 08:38

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.0145	U	0.0579	0.0579	0.160	0.0488	pCi/g	11/06/20 11:01	11/26/20 10:44	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*91.2*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:44*	*1*

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	-0.0259	U	0.0150	0.0151	0.100	0.0174	pCi/g	12/15/20 12:11	12/23/20 14:28	1
Plutonium-239/240	-0.0216	U	0.0193	0.0194	0.100	0.0195	pCi/g	12/15/20 12:11	12/23/20 14:28	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Pu-242 (T)	*97.2*		*30 - 110*	*12/15/20 12:11*	*12/23/20 14:28*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-234	**0.410**		0.0595	0.0688	0.250	0.0132	pCi/g	11/03/20 12:03	12/03/20 16:16	1
Uranium-235/236	**0.0249**		0.0157	0.0159	0.100	0.00579	pCi/g	11/03/20 12:03	12/03/20 16:16	1

Client Sample ID: HPPG-SFU-TU153B-011

Lab Sample ID: 160-40092-13

Date Collected: 10/23/20 10:11
Matrix: Solid
Date Received: 10/26/20 08:38

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-238	**0.375**		0.0553	0.0637	0.250	0.00657	pCi/g	11/03/20 12:03	12/03/20 16:16	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*91.8*		*30 - 110*	*11/03/20 12:03*	*12/03/20 16:16*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	**0.327**		0.335	0.337		0.233	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Actinium 228	**0.170**		0.197	0.198		0.105	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Bismuth-212	0.000	U	0.468	0.468		0.289	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Bismuth-214	**0.256**		0.109	0.113		0.0507	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Cesium-137	-0.0153	U	0.0488	0.0488	0.0700	0.0387	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Lead-210	-0.625	U	1.25	1.25		1.05	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Lead-212	**0.302**		0.0740	0.0837		0.0390	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Lead-214	**0.333**		0.0854	0.0921		0.0381	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Potassium-40	**6.16**		1.05	1.22		0.245	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Protactinium-231	0.403	U	1.28	1.28		1.03	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Protactinium-234	0.00554	U	0.0102	0.0102		0.234	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Radium-226	**0.256**		0.109	0.113	0.200	0.0507	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Radium-228	**0.170**		0.197	0.198		0.105	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Thallium-208	**0.0747**		0.0443	0.0450		0.0214	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Thorium-232	**0.170**		0.197	0.198		0.105	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Thorium-234	**0.520**		0.500	0.503		0.325	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Thorium 228	**0.302**		0.0740	0.0837		0.0390	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Uranium-235	0.228	U	0.178	0.180		0.317	pCi/g	11/04/20 17:38	11/25/20 18:00	1
Uranium-238	**0.520**		0.500	0.503		0.325	pCi/g	11/04/20 17:38	11/25/20 18:00	1

Client Sample ID: HPPG-SFU-TU153B-012

Lab Sample ID: 160-40092-14

Date Collected: 10/23/20 10:15
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0868	U	0.256	0.256		0.214	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Actinium 228	**0.395**		0.117	0.123		0.0197	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Bismuth-212	-0.378	U	0.627	0.628		0.488	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Bismuth-214	**0.304**		0.0795	0.0855		0.0309	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Cesium-137	-0.0170	U	0.0457	0.0457	0.0700	0.0362	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Lead-210	0.403	U	0.767	0.769		0.604	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Lead-212	0.0295	U	0.0786	0.0787		0.0634	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Lead-214	**0.222**		0.0676	0.0714		0.0280	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Potassium-40	**6.34**		0.920	1.13		0.0778	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Protactinium-231	0.279	U	0.914	0.915		1.43	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Protactinium-234	0.0283	U	0.0432	0.0433		0.183	pCi/g	11/03/20 18:38	12/01/20 23:08	1

Client Sample ID: HPPG-SFU-TU153B-012

Lab Sample ID: 160-40092-14

Date Collected: 10/23/20 10:15
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.304**		0.0795	0.0855	0.200	0.0309	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Radium-228	**0.395**		0.117	0.123		0.0197	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Thallium-208	**0.0550**		0.0572	0.0575		0.0275	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Thorium-232	**0.395**		0.117	0.123		0.0197	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Thorium-234	0.000	U	0.307	0.307		0.692	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Thorium 228	0.0295	U	0.0786	0.0787		0.0634	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Uranium-235	0.000	U	0.0469	0.0469		0.347	pCi/g	11/03/20 18:38	12/01/20 23:08	1
Uranium-238	0.000	U	0.307	0.307		0.692	pCi/g	11/03/20 18:38	12/01/20 23:08	1

Client Sample ID: HPPG-SFU-TU153B-013

Lab Sample ID: 160-40092-15

Date Collected: 10/23/20 10:18
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0246	U	0.0725	0.0725		0.309	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Actinium 228	**0.135**		0.198	0.199		0.118	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Bismuth-212	0.000	U	0.369	0.369		0.578	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Bismuth-214	0.0817	U	0.165	0.165		0.144	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Cesium-137	0.00593	U	0.0581	0.0581	0.0700	0.0474	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Lead-210	0.271	U	0.988	0.989		0.724	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Lead-212	**0.318**		0.0850	0.0944		0.0489	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Lead-214	**0.267**		0.108	0.111		0.0683	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Potassium-40	**6.56**		1.12	1.31		0.266	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Protactinium-231	0.304	U	2.78	2.78		2.28	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Protactinium-234	**0.208**		0.183	0.184		0.128	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Radium-226	0.0817	U	0.165	0.165	0.200	0.144	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Radium-228	**0.135**		0.198	0.199		0.118	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Thallium-208	**0.133**		0.0546	0.0563		0.0253	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Thorium-232	**0.135**		0.198	0.199		0.118	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Thorium-234	-0.109	U	0.601	0.601		0.498	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Thorium 228	**0.318**		0.0850	0.0944		0.0489	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Uranium-235	**0.233**		0.197	0.199		0.111	pCi/g	11/03/20 18:38	12/01/20 23:30	1
Uranium-238	-0.109	U	0.601	0.601		0.498	pCi/g	11/03/20 18:38	12/01/20 23:30	1

Client Sample ID: HPPG-SFU-TU153B-014

Lab Sample ID: 160-40092-16

Date Collected: 10/23/20 10:22
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0895	U	0.345	0.345		0.322	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Actinium 228	**0.258**		0.244	0.246		0.116	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Bismuth-212	0.219	U	0.902	0.902		0.722	pCi/g	11/03/20 18:38	12/02/20 11:38	1

Client Sample ID: HPPG-SFU-TU153B-014

Lab Sample ID: 160-40092-16

Date Collected: 10/23/20 10:22
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.255**		0.137	0.139		0.0623	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Cesium-137	-0.0710	U	0.0784	0.0788	0.0700	0.0727	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Lead-210	-0.384	U	1.26	1.26		0.912	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Lead-212	**0.288**		0.0764	0.0850		0.0351	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Lead-214	**0.310**		0.109	0.114		0.0481	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Potassium-40	**5.92**		1.27	1.41		0.250	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Protactinium-231	0.349	U	1.20	1.21		1.91	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Protactinium-234	0.00685	U	0.175	0.175		0.144	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Radium-226	**0.255**		0.137	0.139	0.200	0.0623	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Radium-228	**0.258**		0.244	0.246		0.116	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Thallium-208	**0.113**		0.0466	0.0480		0.0148	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Thorium-232	**0.258**		0.244	0.246		0.116	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Thorium-234	-0.358	U	0.784	0.785		0.652	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Thorium 228	**0.288**		0.0764	0.0850		0.0351	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Uranium-235	**0.226**		0.181	0.182		0.0856	pCi/g	11/03/20 18:38	12/02/20 11:38	1
Uranium-238	-0.358	U	0.784	0.785		0.652	pCi/g	11/03/20 18:38	12/02/20 11:38	1

Client Sample ID: HPPG-SFU-TU153B-015

Lab Sample ID: 160-40092-17

Date Collected: 10/23/20 10:26
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.120	U	0.237	0.238		0.193	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Actinium 228	0.0780	U	0.131	0.131		0.0826	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Bismuth-212	0.166	U	0.411	0.411		0.320	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Bismuth-214	**0.245**		0.0821	0.0860		0.0345	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Cesium-137	-0.0148	U	0.0413	0.0413	0.0700	0.0327	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Lead-210	0.251	U	1.01	1.01		0.820	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Lead-212	**0.259**		0.0579	0.0669		0.0277	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Lead-214	**0.245**		0.0765	0.0806		0.0328	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Potassium-40	**5.72**		0.910	1.08		0.216	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Protactinium-231	0.485	U	1.48	1.48		1.20	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Protactinium-234	-0.0713	U	0.211	0.211		0.172	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Radium-226	**0.245**		0.0821	0.0860	0.200	0.0345	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Radium-228	0.0780	U	0.131	0.131		0.0826	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Thallium-208	**0.0705**		0.0326	0.0334		0.0297	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Thorium-232	0.0780	U	0.131	0.131		0.0826	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Thorium-234	0.160	U	0.345	0.346		0.608	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Thorium 228	**0.259**		0.0579	0.0669		0.0277	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Uranium-235	0.0539	U	0.343	0.343		0.281	pCi/g	11/03/20 18:38	12/02/20 11:39	1
Uranium-238	0.160	U	0.345	0.346		0.608	pCi/g	11/03/20 18:38	12/02/20 11:39	1

Client Sample ID: HPPG-SFU-TU153B-016

Lab Sample ID: 160-40092-18

Date Collected: 10/23/20 10:28
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.0122	U	0.0314	0.0314		0.273	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Actinium 228	**0.216**		0.142	0.144		0.0902	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Bismuth-212	-0.0140	U	0.453	0.453		0.372	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Bismuth-214	**0.292**		0.0896	0.0946		0.0375	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Cesium-137	-0.0333	U	0.0509	0.0510	0.0700	0.0394	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Lead-210	0.472	U	0.958	0.959		0.762	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Lead-212	**0.313**		0.0594	0.0719		0.0232	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Lead-214	**0.302**		0.0709	0.0775		0.0420	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Potassium-40	**6.94**		0.974	1.20		0.0796	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Protactinium-231	0.000	U	0.268	0.268		1.45	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Protactinium-234	0.0339	U	0.0497	0.0498		0.170	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Radium-226	**0.292**		0.0896	0.0946	0.200	0.0375	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Radium-228	**0.216**		0.142	0.144		0.0902	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Thallium-208	**0.136**		0.0403	0.0427		0.0107	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Thorium-232	**0.216**		0.142	0.144		0.0902	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Thorium-234	0.257	U	0.833	0.833		0.680	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Thorium 228	**0.313**		0.0594	0.0719		0.0232	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Uranium-235	0.0786	U	0.229	0.229		0.290	pCi/g	11/03/20 18:38	12/02/20 11:40	1
Uranium-238	0.257	U	0.833	0.833		0.680	pCi/g	11/03/20 18:38	12/02/20 11:40	1

Client Sample ID: HPPG-SFU-TU153B-017

Lab Sample ID: 160-40092-19

Date Collected: 10/23/20 10:31
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.207	U	0.326	0.327		0.292	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Actinium 228	**0.309**		0.198	0.201		0.118	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Bismuth-212	-0.355	U	0.851	0.852		0.669	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Bismuth-214	**0.302**		0.102	0.107		0.0360	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Cesium-137	0.000167	U	0.0684	0.0684	0.0700	0.0563	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Lead-210	-0.702	U	1.85	1.85		1.54	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Lead-212	**0.287**		0.0785	0.0855		0.0390	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Lead-214	**0.253**		0.104	0.108		0.0491	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Potassium-40	**7.11**		1.29	1.52		0.266	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Protactinium-231	0.637	U	1.90	1.91		2.09	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Protactinium-234	0.00955	U	0.0179	0.0179		0.268	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Radium-226	**0.302**		0.102	0.107	0.200	0.0360	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Radium-228	**0.309**		0.198	0.201		0.118	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Thallium-208	**0.174**		0.0524	0.0561		0.0146	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Thorium-232	**0.309**		0.198	0.201		0.118	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Thorium-234	**0.495**		0.519	0.523		0.400	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Thorium 228	**0.287**		0.0785	0.0855		0.0390	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Uranium-235	-0.0108	U	0.661	0.661		0.544	pCi/g	11/03/20 18:38	12/02/20 12:17	1
Uranium-238	**0.495**		0.519	0.523		0.400	pCi/g	11/03/20 18:38	12/02/20 12:17	1

Client Sample ID: HPPG-SFU-TU153B-018

Lab Sample ID: 160-40092-20

Date Collected: 10/23/20 10:34
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.186	U	0.302	0.303		0.227	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Actinium 228	**0.397**		0.120	0.126		0.0336	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Bismuth-212	-0.350	U	0.832	0.833		0.653	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Bismuth-214	**0.391**		0.119	0.126		0.0401	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Cesium-137	**0.0598**		0.0572	0.0575	0.0700	0.0401	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Lead-210	-0.680	U	1.81	1.81		1.51	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Lead-212	**0.335**		0.0771	0.0847		0.0369	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Lead-214	**0.275**		0.0846	0.0890		0.0420	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Potassium-40	**7.40**		1.35	1.54		0.208	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Protactinium-231	-0.330	U	2.30	2.30		1.88	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Protactinium-234	-0.0919	U	0.285	0.285		0.232	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Radium-226	**0.391**		0.119	0.126	0.200	0.0401	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Radium-228	**0.397**		0.120	0.126		0.0336	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Thallium-208	**0.136**		0.0541	0.0559		0.0175	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Thorium-232	**0.397**		0.120	0.126		0.0336	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Thorium-234	-0.870	U	0.530	0.539		0.715	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Thorium 228	**0.335**		0.0771	0.0847		0.0369	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Uranium-235	-0.00716	U	0.0423	0.0423		0.416	pCi/g	11/03/20 18:38	12/02/20 12:09	1
Uranium-238	-0.870	U	0.530	0.539		0.715	pCi/g	11/03/20 18:38	12/02/20 12:09	1

Client Sample ID: HPPG-SFU-TU153B-019

Lab Sample ID: 160-40092-21

Date Collected: 10/23/20 10:37
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0515	U	0.220	0.221		0.343	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Actinium 228	**0.132**		0.208	0.209		0.123	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Bismuth-212	-0.452	U	1.00	1.00		0.786	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Bismuth-214	0.131	U	0.111	0.112		0.183	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Cesium-137	-0.0256	U	0.0649	0.0649	0.0700	0.0578	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Lead-210	0.391	U	0.943	0.944		0.665	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Lead-212	**0.296**		0.0897	0.0975		0.0496	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Lead-214	**0.348**		0.0997	0.106		0.0559	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Potassium-40	**7.26**		1.45	1.63		0.266	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Protactinium-231	0.000	U	0.136	0.136		2.01	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Protactinium-234	-0.0182	U	0.0864	0.0864		0.158	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Radium-226	0.131	U	0.111	0.112	0.200	0.183	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Radium-228	**0.132**		0.208	0.209		0.123	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Thallium-208	**0.189**		0.0662	0.0691		0.0202	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Thorium-232	**0.132**		0.208	0.209		0.123	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Thorium-234	**0.822**		0.483	0.492		0.306	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Thorium 228	**0.296**		0.0897	0.0975		0.0496	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Uranium-235	-0.0610	U	0.154	0.155		0.292	pCi/g	11/03/20 18:38	12/02/20 12:11	1
Uranium-238	**0.822**		0.483	0.492		0.306	pCi/g	11/03/20 18:38	12/02/20 12:11	1

Client Sample ID: HPPG-SFU-TU153B-020

Lab Sample ID: 160-40092-22

Date Collected: 10/23/20 10:41
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0597	U	0.118	0.118		0.294	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Actinium 228	**0.434**		0.156	0.163		0.105	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Bismuth-212	0.191	U	0.391	0.391		0.293	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Bismuth-214	**0.319**		0.105	0.111		0.0424	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Cesium-137	0.0305	U	0.0560	0.0561	0.0700	0.0435	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Lead-210	0.587	U	1.30	1.30		1.04	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Lead-212	**0.317**		0.0760	0.0864		0.0395	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Lead-214	**0.342**		0.0896	0.0964		0.0494	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Potassium-40	**7.56**		1.18	1.41		0.275	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Protactinium-231	0.000	U	0.382	0.382		1.77	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Protactinium-234	-0.0604	U	0.233	0.233		0.190	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Radium-226	**0.319**		0.105	0.111	0.200	0.0424	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Radium-228	**0.434**		0.156	0.163		0.105	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Thallium-208	**0.0841**		0.0847	0.0852		0.0378	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Thorium-232	**0.434**		0.156	0.163		0.105	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Thorium-234	0.210	U	0.880	0.881		0.719	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Thorium 228	**0.317**		0.0760	0.0864		0.0395	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Uranium-235	0.0986	U	0.168	0.168		0.330	pCi/g	11/03/20 18:38	12/02/20 12:18	1
Uranium-238	0.210	U	0.880	0.881		0.719	pCi/g	11/03/20 18:38	12/02/20 12:18	1

Client Sample ID: HPPG-SFU-TU153B-021

Lab Sample ID: 160-40092-23

Date Collected: 10/23/20 10:44
Matrix: Solid
Date Received: 10/26/20 08:38

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0180	U	0.0512	0.0512	0.160	0.0403	pCi/g	11/06/20 11:01	11/26/20 10:45	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*87.5*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:45*	*1*

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	-0.0177	U	0.0152	0.0153	0.100	0.0159	pCi/g	12/15/20 12:11	12/23/20 14:28	1
Plutonium-239/240	-0.00985	U	0.0163	0.0163	0.100	0.0152	pCi/g	12/15/20 12:11	12/23/20 14:28	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Pu-242 (T)	*97.4*		*30 - 110*	*12/15/20 12:11*	*12/23/20 14:28*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-234	**0.337**		0.0575	0.0641	0.250	0.0160	pCi/g	11/03/20 12:03	12/03/20 16:16	1
Uranium-235/236	0.00811	U	0.0143	0.0143	0.100	0.00889	pCi/g	11/03/20 12:03	12/03/20 16:16	1

Client Sample ID: HPPG-SFU-TU153B-021

Lab Sample ID: 160-40092-23

Date Collected: 10/23/20 10:44
Matrix: Solid
Date Received: 10/26/20 08:38

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-238	**0.356**		0.0559	0.0633	0.250	0.00504	pCi/g	11/03/20 12:03	12/03/20 16:16	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*78.9*		*30 - 110*	*11/03/20 12:03*	*12/03/20 16:16*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.256	U	0.497	0.498		0.295	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Actinium 228	**0.309**		0.172	0.176		0.0807	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Bismuth-212	0.313	U	0.693	0.694		0.536	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Bismuth-214	**0.347**		0.128	0.134		0.0468	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Cesium-137	0.00143	U	0.0779	0.0779	0.0700	0.0640	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Lead-210	0.661	U	1.49	1.49		0.983	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Lead-212	**0.327**		0.138	0.143		0.0682	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Lead-214	**0.191**		0.119	0.121		0.0820	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Potassium-40	**7.69**		1.34	1.61		0.269	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Protactinium-231	0.745	U	1.93	1.94		2.12	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Protactinium-234	-0.108	U	0.328	0.328		0.267	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Radium-226	**0.347**		0.128	0.134	0.200	0.0468	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Radium-228	**0.309**		0.172	0.176		0.0807	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Thallium-208	**0.119**		0.0514	0.0532		0.0206	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Thorium-232	**0.309**		0.172	0.176		0.0807	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Thorium-234	-0.535	U	0.864	0.866		0.834	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Thorium 228	**0.327**		0.138	0.143		0.0682	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Uranium-235	0.0294	U	0.197	0.197		0.543	pCi/g	11/04/20 17:38	11/25/20 18:01	1
Uranium-238	-0.535	U	0.864	0.866		0.834	pCi/g	11/04/20 17:38	11/25/20 18:01	1

Client Sample ID: HPPG-SFU-TU153B-022

Lab Sample ID: 160-40092-24

Date Collected: 10/23/20 10:47
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.191	U	0.277	0.278		0.199	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Actinium 228	**0.281**		0.170	0.173		0.0745	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Bismuth-212	-0.395	U	0.618	0.620		0.481	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Bismuth-214	**0.304**		0.0783	0.0845		0.0302	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Cesium-137	0.0120	U	0.0301	0.0301	0.0700	0.0233	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Lead-210	0.370	U	1.03	1.03		0.829	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Lead-212	0.0357	U	0.0854	0.0855		0.0689	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Lead-214	**0.264**		0.0693	0.0746		0.0397	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Potassium-40	**5.93**		1.17	1.32		0.372	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Protactinium-231	0.0752	U	0.897	0.897		1.51	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Protactinium-234	0.0657	U	0.185	0.185		0.151	pCi/g	11/03/20 18:38	12/02/20 12:19	1

Client Sample ID: HPPG-SFU-TU153B-022

Lab Sample ID: 160-40092-24

Date Collected: 10/23/20 10:47
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Radium-226	**0.304**		0.0783	0.0845	0.200	0.0302	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Radium-228	**0.281**		0.170	0.173		0.0745	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Thallium-208	**0.0868**		0.0385	0.0395		0.0163	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Thorium-232	**0.281**		0.170	0.173		0.0745	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Thorium-234	0.000	U	0.267	0.267		0.701	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Thorium 228	0.0357	U	0.0854	0.0855		0.0689	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Uranium-235	0.0612	U	0.156	0.157		0.267	pCi/g	11/03/20 18:38	12/02/20 12:19	1
Uranium-238	0.000	U	0.267	0.267		0.701	pCi/g	11/03/20 18:38	12/02/20 12:19	1

Client Sample ID: HPPG-SFU-TU153B-023

Lab Sample ID: 160-40092-25

Date Collected: 10/23/20 10:50
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.118	U	0.328	0.328		0.269	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Actinium 228	**0.207**		0.206	0.207		0.104	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Bismuth-212	-0.0218	U	0.601	0.601		0.492	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Bismuth-214	**0.389**		0.108	0.116		0.0374	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Cesium-137	0.0277	U	0.0523	0.0524	0.0700	0.0399	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Lead-210	-0.198	U	1.40	1.40		1.15	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Lead-212	**0.235**		0.0851	0.0904		0.0535	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Lead-214	**0.369**		0.105	0.111		0.0320	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Potassium-40	**7.17**		1.27	1.47		0.132	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Protactinium-231	0.619	U	1.50	1.50		1.65	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Protactinium-234	-0.0350	U	0.0688	0.0689		0.245	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Radium-226	**0.389**		0.108	0.116	0.200	0.0374	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Radium-228	**0.207**		0.206	0.207		0.104	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Thallium-208	**0.0902**		0.0938	0.0943		0.0396	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Thorium-232	**0.207**		0.206	0.207		0.104	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Thorium-234	-0.842	U	0.550	0.558		0.988	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Thorium 228	**0.235**		0.0851	0.0904		0.0535	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Uranium-235	-0.00461	U	0.00916	0.00917		0.481	pCi/g	11/03/20 18:38	12/02/20 12:20	1
Uranium-238	-0.842	U	0.550	0.558		0.988	pCi/g	11/03/20 18:38	12/02/20 12:20	1

Client Sample ID: HPPG-SFU-TU153B-024

Lab Sample ID: 160-40092-26

Date Collected: 10/23/20 10:54
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.0889	U	0.200	0.200		0.299	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Actinium 228	**0.476**		0.134	0.142		0.0325	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Bismuth-212	0.280	U	0.695	0.696		0.542	pCi/g	11/04/20 17:38	11/25/20 19:20	1

Client Sample ID: HPPG-SFU-TU153B-024

Lab Sample ID: 160-40092-26

Date Collected: 10/23/20 10:54
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Bismuth-214	**0.294**		0.103	0.108		0.0374	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Cesium-137	-0.000617	U	0.0549	0.0549	0.0700	0.0317	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Lead-210	-1.01	U	1.73	1.74		1.46	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Lead-212	**0.342**		0.0737	0.0819		0.0324	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Lead-214	**0.356**		0.0921	0.0989		0.0319	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Potassium-40	**8.44**		1.42	1.65		0.202	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Protactinium-231	0.000	U	0.470	0.470		1.81	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Protactinium-234	0.118	U	0.182	0.182		0.138	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Radium-226	**0.294**		0.103	0.108	0.200	0.0374	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Radium-228	**0.476**		0.134	0.142		0.0325	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thallium-208	**0.105**		0.0460	0.0472		0.0166	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thorium-232	**0.476**		0.134	0.142		0.0325	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thorium-234	**0.543**		0.391	0.396		0.325	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thorium 228	**0.342**		0.0737	0.0819		0.0324	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Uranium-235	-0.156	U	0.235	0.235		0.301	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Uranium-238	**0.543**		0.391	0.396		0.325	pCi/g	11/04/20 17:38	11/25/20 19:20	1

Client Sample ID: HPPG-SFU-TU153B-025

Lab Sample ID: 160-40092-27

Date Collected: 10/23/20 10:57
Matrix: Solid
Date Received: 10/26/20 08:38

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	-0.0551	U	0.638	0.638		0.394	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Actinium 228	**0.413**		0.147	0.153		0.0383	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Bismuth-212	0.683	U	1.47	1.47		1.17	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Bismuth-214	**0.266**		0.122	0.125		0.0567	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Cesium-137	-0.0197	U	0.0753	0.0753	0.0700	0.0514	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Lead-210	0.00688	U	1.36	1.36		0.962	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Lead-212	**0.319**		0.0864	0.0957		0.0438	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Lead-214	**0.256**		0.0945	0.0981		0.0524	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Potassium-40	**7.32**		1.43	1.62		0.259	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Protactinium-231	-0.754	U	2.42	2.42		1.96	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Protactinium-234	0.0791	U	0.225	0.225		0.149	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Radium-226	**0.266**		0.122	0.125	0.200	0.0567	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Radium-228	**0.413**		0.147	0.153		0.0383	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thallium-208	**0.0865**		0.0716	0.0722		0.0369	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thorium-232	**0.413**		0.147	0.153		0.0383	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thorium-234	**0.488**		0.473	0.476		0.355	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Thorium 228	**0.319**		0.0864	0.0957		0.0438	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Uranium-235	0.0978	U	0.291	0.291		0.234	pCi/g	11/04/20 17:38	11/25/20 19:20	1
Uranium-238	**0.488**		0.473	0.476		0.355	pCi/g	11/04/20 17:38	11/25/20 19:20	1

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40092-1
SDG: GJ46599779

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-488460/24-A
Matrix: Solid
Analysis Batch: 490292

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 488460

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.01989	U	0.0586	0.0586	0.160	0.0499	pCi/g	11/06/20 11:01	11/26/20 10:48	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*86.4*		*40 - 110*	*11/06/20 11:01*	*11/26/20 10:48*	*1*

Lab Sample ID: LCS 160-488460/1-A
Matrix: Solid
Analysis Batch: 490302

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 488460

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	7.77	6.487		0.537	0.160	0.0549	pCi/g	83	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*89.5*		*40 - 110*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-487802/1-A
Matrix: Solid
Analysis Batch: 490870

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 487802

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-234	0.006585	U	0.0116	0.0116	0.250	0.00722	pCi/g	11/03/20 12:03	12/03/20 16:16	1
Uranium-235/236	-0.002731	U	0.00546	0.00547	0.100	0.00635	pCi/g	11/03/20 12:03	12/03/20 16:16	1
Uranium-238	0.008762		0.00876	0.00879	0.250	0.00510	pCi/g	11/03/20 12:03	12/03/20 16:16	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*81.0*		*30 - 110*	*11/03/20 12:03*	*12/03/20 16:16*	*1*

Lab Sample ID: LCS 160-487802/2-A
Matrix: Solid
Analysis Batch: 490871

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 487802

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Uranium-234	3.18	2.913		0.293	0.250	0.0103	pCi/g	91	84 - 120
Uranium-238	3.26	3.199		0.317	0.250	0.00514	pCi/g	98	82 - 122

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Uranium-232	*75.9*		*30 - 110*

QC Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40092-1
SDG: GJ46599779

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Lab Sample ID: MB 160-491927/1-A
Matrix: Solid
Analysis Batch: 493064

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491927

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.0000	U	0.0130	0.0130	0.100	0.0107	pCi/g	12/15/20 12:11	12/23/20 14:28	1
Plutonium-239/240	-0.01688	U	0.0124	0.0125	0.100	0.0138	pCi/g	12/15/20 12:11	12/23/20 14:28	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Pu-242 (T)	*89.2*		*30 - 110*	*12/15/20 12:11*	*12/23/20 14:28*	*1*

Lab Sample ID: LCS 160-491927/2-A
Matrix: Solid
Analysis Batch: 493065

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491927

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Plutonium-238	2.61	2.475		0.251	0.100	0.00459	pCi/g	95	80 - 125
Plutonium-239/240	2.64	2.610		0.262	0.100	0.00796	pCi/g	99	81 - 125

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Pu-242 (T)	*88.4*		*30 - 110*

Lab Sample ID: 160-40092-23 DU
Matrix: Solid
Analysis Batch: 493079

Client Sample ID: HPPG-SFU-TU153B-021
Prep Type: Total/NA
Prep Batch: 491927

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Plutonium-238	-0.0177	U	0.004075	U	0.00816	0.100	0.00474	pCi/g	0.93	1
Plutonium-239/240	-0.00985	U	-0.002040	U	0.00912	0.100	0.00822	pCi/g	0.31	1

Tracer	*DU %Yield*	*DU Qualifier*	*Limits*
Pu-242 (T)	*84.1*		*30 - 110*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-487748/1-A
Matrix: Solid
Analysis Batch: 490284

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 487748

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.1241	U	0.178	0.178		0.205	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Actinium 228	0.04976	U	0.0934	0.0935		0.0883	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Bismuth-212	0.0000	U	0.245	0.245		0.188	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Bismuth-214	-0.04153	U	0.129	0.129		0.108	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Cesium-137	0.0000	U	0.00904	0.00904	0.0700	0.0192	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Lead-210	0.3548	U	0.673	0.674		0.514	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Lead-212	0.02518	U	0.0734	0.0734		0.0587	pCi/g	11/02/20 17:57	11/26/20 10:12	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-487748/1-A
Matrix: Solid
Analysis Batch: 490284

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 487748

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Lead-214	0.003956	U	0.0202	0.0202		0.0598	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Potassium-40	0.2366		0.212	0.213		0.110	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Protactinium-231	0.0000	U	0.263	0.263		1.33	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Protactinium-234	0.1210	U	0.191	0.191		0.130	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Radium-226	-0.04153	U	0.129	0.129	0.200	0.108	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Radium-228	0.04976	U	0.0934	0.0935		0.0883	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Thallium-208	-0.04052	U	0.0744	0.0745		0.0390	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Thorium-232	0.04976	U	0.0934	0.0935		0.0883	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Thorium-234	-0.2016	U	0.734	0.735		0.597	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Thorium 228	0.02518	U	0.0734	0.0734		0.0587	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Uranium-235	0.0000	U	0.126	0.126		0.237	pCi/g	11/02/20 17:57	11/26/20 10:12	1
Uranium-238	-0.2016	U	0.734	0.735		0.597	pCi/g	11/02/20 17:57	11/26/20 10:12	1

Lab Sample ID: LCS 160-487748/2-A
Matrix: Solid
Analysis Batch: 490338

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 487748

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	97.61		11.4		0.503	pCi/g	101	87 - 116
Cesium-137	26.8	27.93		2.95	0.0700	0.106	pCi/g	104	87 - 120
Cobalt-60	9.52	9.537		1.02		0.0382	pCi/g	100	87 - 115

Lab Sample ID: 160-40092-11 DU
Matrix: Solid
Analysis Batch: 490281

Client Sample ID: HPPG-SFU-TU153B-009
Prep Type: Total/NA
Prep Batch: 487748

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Actinium-227	0.0604	U	0.1525	U	0.335		0.251	pCi/g	0.21	1
Actinium 228	0.411		0.1797	U	0.265		0.217	pCi/g	0.53	1
Bismuth-212	0.375	U	-0.3709	U	0.971		0.763	pCi/g	0.43	1
Bismuth-214	0.290		0.3283		0.148		0.0703	pCi/g	0.13	1
Cesium-137	-0.0246	U	-0.02101	U	0.0547	0.0700	0.0548	pCi/g	0.03	1
Lead-210	-2.61	U	-0.1088	U	1.22		0.871	pCi/g	0.87	1
Lead-212	0.308		0.3125		0.0985		0.0469	pCi/g	0.02	1
Lead-214	0.0295	U	0.3633		0.137		0.0593	pCi/g	1.20	1
Potassium-40	7.84		5.886		1.46		0.276	pCi/g	0.60	1
Protactinium-231	0.0000000159	U	0.3325	U	0.989		1.59	pCi/g	0.09	1
Protactinium-234	-0.118	U	-0.01142	U	0.0254		0.172	pCi/g	0.28	1
Radium-226	0.290		0.3283		0.148	0.200	0.0703	pCi/g	0.13	1
Radium-228	0.411		0.1797	U	0.265		0.217	pCi/g	0.53	1
Thallium-208	0.103		0.08387		0.0605		0.0284	pCi/g	0.16	1
Thorium-232	0.411		0.1797	U	0.265		0.217	pCi/g	0.53	1
Thorium-234	0.700		0.1558	U	0.473		0.377	pCi/g	0.48	1
Thorium 228	0.308		0.3125		0.0985		0.0469	pCi/g	0.02	1
Uranium-235	0.242	U	0.1062	U	0.248		0.241	pCi/g	0.29	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40092-11 DU
Matrix: Solid
Analysis Batch: 490281

Client Sample ID: HPPG-SFU-TU153B-009
Prep Type: Total/NA
Prep Batch: 487748

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Uranium-238	0.700		0.1558	U	0.473		0.377	pCi/g	0.48	1

Lab Sample ID: MB 160-488132/1-A
Matrix: Solid
Analysis Batch: 490615

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 488132

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.009977	U	0.0270	0.0270		0.294	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Actinium 228	-0.007761	U	0.0124	0.0125		0.138	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Bismuth-212	0.2527	U	0.544	0.545		0.409	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Bismuth-214	-0.03229	U	0.160	0.160		0.133	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Cesium-137	-0.03466	U	0.0621	0.0622	0.0700	0.0473	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Lead-210	0.4648	U	1.28	1.28		0.898	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Lead-212	0.09539		0.0865	0.0873		0.0632	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Lead-214	-0.09745	U	0.0727	0.0734		0.0988	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Potassium-40	0.03303	U	0.830	0.830		0.491	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Protactinium-231	0.5484	U	1.57	1.57		1.72	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Protactinium-234	0.07113	U	0.178	0.178		0.106	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Radium-226	-0.03229	U	0.160	0.160	0.200	0.133	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Radium-228	-0.007761	U	0.0124	0.0125		0.138	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Thallium-208	-0.04653	U	0.0864	0.0865		0.0492	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Thorium-232	-0.007761	U	0.0124	0.0125		0.138	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Thorium-234	-0.4923	U	0.834	0.836		0.667	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Thorium 228	0.09539		0.0865	0.0873		0.0632	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Uranium-235	-0.02091	U	0.450	0.450		0.205	pCi/g	11/03/20 18:38	12/01/20 22:02	1
Uranium-238	-0.4923	U	0.834	0.836		0.667	pCi/g	11/03/20 18:38	12/01/20 22:02	1

Lab Sample ID: LCS 160-488132/2-A
Matrix: Solid
Analysis Batch: 490612

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 488132

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	95.77		10.1		0.656	pCi/g	99	87 - 116
Cesium-137	26.7	26.51		2.86	0.0700	0.114	pCi/g	99	87 - 120
Cobalt-60	9.51	9.333		1.01		0.0186	pCi/g	98	87 - 115

Lab Sample ID: MB 160-488229/1-A
Matrix: Solid
Analysis Batch: 490261

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 488229

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.009307	U	0.0193	0.0193		0.451	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Actinium 228	-0.03281	U	0.0424	0.0425		0.207	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Bismuth-212	0.0000	U	0.211	0.211		0.491	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Bismuth-214	-0.1961	U	0.130	0.131		0.299	pCi/g	11/04/20 17:38	11/25/20 17:48	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-488229/1-A
Matrix: Solid
Analysis Batch: 490261

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 488229

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Cesium-137	-0.01941	U	0.0667	0.0667	0.0700	0.0572	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Lead-210	0.3158	U	1.03	1.03		0.730	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Lead-212	0.02194	U	0.124	0.124		0.100	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Lead-214	-0.02104	U	0.105	0.106		0.0884	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Potassium-40	-0.3910	U	1.27	1.27		0.629	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Protactinium-231	0.0000	U	0.266	0.266		2.38	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Protactinium-234	0.09066	U	0.244	0.244		0.115	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Radium-226	-0.1961	U	0.130	0.131	0.200	0.299	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Radium-228	-0.03281	U	0.0424	0.0425		0.207	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Thallium-208	0.06514		0.0492	0.0497		0.0280	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Thorium-232	-0.03281	U	0.0424	0.0425		0.207	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Thorium-234	-0.3284	U	0.611	0.612		0.523	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Thorium 228	0.02194	U	0.124	0.124		0.100	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Uranium-235	0.05125	U	0.114	0.114		0.231	pCi/g	11/04/20 17:38	11/25/20 17:48	1
Uranium-238	-0.3284	U	0.611	0.612		0.523	pCi/g	11/04/20 17:38	11/25/20 17:48	1

Lab Sample ID: LCS 160-488229/2-A
Matrix: Solid
Analysis Batch: 490255

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 488229

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	101.1		10.6		0.453	pCi/g	105	87 - 116
Cesium-137	26.8	25.32		2.69	0.0700	0.0777	pCi/g	95	87 - 120
Cobalt-60	9.53	9.078		0.954		0.0437	pCi/g	95	87 - 115

Rad

Leach Batch: 486979

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-1	HPPG-F-019	Total/NA	Solid	Dry and Grind	
160-40092-2	HPPG-F-020	Total/NA	Solid	Dry and Grind	
160-40092-3	HPPG-SFU-TU153B-001	Total/NA	Solid	Dry and Grind	
160-40092-4	HPPG-SFU-TU153B-002	Total/NA	Solid	Dry and Grind	
160-40092-5	HPPG-SFU-TU153B-003	Total/NA	Solid	Dry and Grind	
160-40092-6	HPPG-SFU-TU153B-004	Total/NA	Solid	Dry and Grind	
160-40092-7	HPPG-SFU-TU153B-005	Total/NA	Solid	Dry and Grind	
160-40092-8	HPPG-SFU-TU153B-006	Total/NA	Solid	Dry and Grind	
160-40092-9	HPPG-SFU-TU153B-007	Total/NA	Solid	Dry and Grind	
160-40092-10	HPPG-SFU-TU153B-008	Total/NA	Solid	Dry and Grind	
160-40092-11	HPPG-SFU-TU153B-009	Total/NA	Solid	Dry and Grind	
160-40092-12	HPPG-SFU-TU153B-010	Total/NA	Solid	Dry and Grind	
160-40092-13	HPPG-SFU-TU153B-011	Total/NA	Solid	Dry and Grind	
160-40092-14	HPPG-SFU-TU153B-012	Total/NA	Solid	Dry and Grind	
160-40092-15	HPPG-SFU-TU153B-013	Total/NA	Solid	Dry and Grind	
160-40092-16	HPPG-SFU-TU153B-014	Total/NA	Solid	Dry and Grind	
160-40092-17	HPPG-SFU-TU153B-015	Total/NA	Solid	Dry and Grind	
160-40092-18	HPPG-SFU-TU153B-016	Total/NA	Solid	Dry and Grind	
160-40092-19	HPPG-SFU-TU153B-017	Total/NA	Solid	Dry and Grind	
160-40092-20	HPPG-SFU-TU153B-018	Total/NA	Solid	Dry and Grind	
160-40092-21	HPPG-SFU-TU153B-019	Total/NA	Solid	Dry and Grind	
160-40092-22	HPPG-SFU-TU153B-020	Total/NA	Solid	Dry and Grind	
160-40092-23	HPPG-SFU-TU153B-021	Total/NA	Solid	Dry and Grind	
160-40092-24	HPPG-SFU-TU153B-022	Total/NA	Solid	Dry and Grind	
160-40092-11 DU	HPPG-SFU-TU153B-009	Total/NA	Solid	Dry and Grind	
160-40092-23 DU	HPPG-SFU-TU153B-021	Total/NA	Solid	Dry and Grind	

Leach Batch: 487034

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-25	HPPG-SFU-TU153B-023	Total/NA	Solid	Dry and Grind	
160-40092-26	HPPG-SFU-TU153B-024	Total/NA	Solid	Dry and Grind	
160-40092-27	HPPG-SFU-TU153B-025	Total/NA	Solid	Dry and Grind	

Prep Batch: 487748

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-1	HPPG-F-019	Total/NA	Solid	Fill_Geo-21	486979
160-40092-2	HPPG-F-020	Total/NA	Solid	Fill_Geo-21	486979
160-40092-3	HPPG-SFU-TU153B-001	Total/NA	Solid	Fill_Geo-21	486979
160-40092-4	HPPG-SFU-TU153B-002	Total/NA	Solid	Fill_Geo-21	486979
160-40092-5	HPPG-SFU-TU153B-003	Total/NA	Solid	Fill_Geo-21	486979
160-40092-6	HPPG-SFU-TU153B-004	Total/NA	Solid	Fill_Geo-21	486979
160-40092-7	HPPG-SFU-TU153B-005	Total/NA	Solid	Fill_Geo-21	486979
160-40092-8	HPPG-SFU-TU153B-006	Total/NA	Solid	Fill_Geo-21	486979
160-40092-9	HPPG-SFU-TU153B-007	Total/NA	Solid	Fill_Geo-21	486979
160-40092-10	HPPG-SFU-TU153B-008	Total/NA	Solid	Fill_Geo-21	486979
160-40092-11	HPPG-SFU-TU153B-009	Total/NA	Solid	Fill_Geo-21	486979
MB 160-487748/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-487748/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40092-11 DU	HPPG-SFU-TU153B-009	Total/NA	Solid	Fill_Geo-21	486979

Rad

Prep Batch: 487802

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-3	HPPG-SFU-TU153B-001	Total/NA	Solid	ExtChrom	486979
160-40092-13	HPPG-SFU-TU153B-011	Total/NA	Solid	ExtChrom	486979
160-40092-23	HPPG-SFU-TU153B-021	Total/NA	Solid	ExtChrom	486979
MB 160-487802/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-487802/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Prep Batch: 488132

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-12	HPPG-SFU-TU153B-010	Total/NA	Solid	Fill_Geo-21	486979
160-40092-14	HPPG-SFU-TU153B-012	Total/NA	Solid	Fill_Geo-21	486979
160-40092-15	HPPG-SFU-TU153B-013	Total/NA	Solid	Fill_Geo-21	486979
160-40092-16	HPPG-SFU-TU153B-014	Total/NA	Solid	Fill_Geo-21	486979
160-40092-17	HPPG-SFU-TU153B-015	Total/NA	Solid	Fill_Geo-21	486979
160-40092-18	HPPG-SFU-TU153B-016	Total/NA	Solid	Fill_Geo-21	486979
160-40092-19	HPPG-SFU-TU153B-017	Total/NA	Solid	Fill_Geo-21	486979
160-40092-20	HPPG-SFU-TU153B-018	Total/NA	Solid	Fill_Geo-21	486979
160-40092-21	HPPG-SFU-TU153B-019	Total/NA	Solid	Fill_Geo-21	486979
160-40092-22	HPPG-SFU-TU153B-020	Total/NA	Solid	Fill_Geo-21	486979
160-40092-24	HPPG-SFU-TU153B-022	Total/NA	Solid	Fill_Geo-21	486979
160-40092-25	HPPG-SFU-TU153B-023	Total/NA	Solid	Fill_Geo-21	487034
MB 160-488132/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-488132/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 488229

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-13	HPPG-SFU-TU153B-011	Total/NA	Solid	Fill_Geo-21	486979
160-40092-23	HPPG-SFU-TU153B-021	Total/NA	Solid	Fill_Geo-21	486979
160-40092-26	HPPG-SFU-TU153B-024	Total/NA	Solid	Fill_Geo-21	487034
160-40092-27	HPPG-SFU-TU153B-025	Total/NA	Solid	Fill_Geo-21	487034
MB 160-488229/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-488229/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 488460

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-3	HPPG-SFU-TU153B-001	Total/NA	Solid	DPS-0	486979
160-40092-13	HPPG-SFU-TU153B-011	Total/NA	Solid	DPS-0	486979
160-40092-23	HPPG-SFU-TU153B-021	Total/NA	Solid	DPS-0	486979
MB 160-488460/24-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-488460/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Prep Batch: 491927

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40092-3	HPPG-SFU-TU153B-001	Total/NA	Solid	ExtChrom	486979
160-40092-13	HPPG-SFU-TU153B-011	Total/NA	Solid	ExtChrom	486979
160-40092-23	HPPG-SFU-TU153B-021	Total/NA	Solid	ExtChrom	486979
MB 160-491927/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491927/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	
160-40092-23 DU	HPPG-SFU-TU153B-021	Total/NA	Solid	ExtChrom	486979

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40092-1
SDG: GJ46599779

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Sr
Lab Sample ID	Client Sample ID	(40-110)
160-40092-3	HPPG-SFU-TU153B-001	88.8
160-40092-13	HPPG-SFU-TU153B-011	91.2
160-40092-23	HPPG-SFU-TU153B-021	87.5
LCS 160-488460/1-A	Lab Control Sample	89.5
MB 160-488460/24-A	Method Blank	86.4

Tracer/Carrier Legend

Sr = Sr Carrier

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Pu-242 (T)
Lab Sample ID	Client Sample ID	(30-110)
160-40092-3	HPPG-SFU-TU153B-001	99.0
160-40092-13	HPPG-SFU-TU153B-011	97.2
160-40092-23	HPPG-SFU-TU153B-021	97.4
160-40092-23 DU	HPPG-SFU-TU153B-021	84.1
LCS 160-491927/2-A	Lab Control Sample	88.4
MB 160-491927/1-A	Method Blank	89.2

Tracer/Carrier Legend

Pu-242 (T) = Pu-242 (T)

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		U-232
Lab Sample ID	Client Sample ID	(30-110)
160-40092-3	HPPG-SFU-TU153B-001	79.2
160-40092-13	HPPG-SFU-TU153B-011	91.8
160-40092-23	HPPG-SFU-TU153B-021	78.9
LCS 160-487802/2-A	Lab Control Sample	75.9
MB 160-487802/1-A	Method Blank	81.0

Tracer/Carrier Legend

U-232 = Uranium-232

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ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40096-1
Laboratory Sample Delivery Group: D1189471
Client Project/Site: HPNS-Parcel G 501197
Revision: 1

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/12/2021 4:38:21 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

Table of Contents

Job ID: 160-40096-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40096-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an ""as received"" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Additional information requested in case narrative for total strontium

Job ID: 160-40096-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT

The samples were received on 10/26/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 13.9 C.

TOTAL BETA STRONTIUM (GFPC)

Sample HPPG-SFU-TU153B-B-001 (160-40096-1) was analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 10/28/2020, prepared on 11/25/2020 and analyzed on 12/11/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP.HPPG-SFU-TU153B-B-001 (160-40096-1) and (160-40096-A-1-A DU).

The method blank (MB) Z-score is within limits and is located in the level IV raw data.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC PLUTONIUM (ALPHA SPECTROMETRY)

Sample HPPG-SFU-TU153B-B-001 (160-40096-1) was analyzed for Isotopic Plutonium (Alpha Spectrometry) in accordance with A-01-R. The samples were dried on 10/28/2020, prepared on 11/10/2020 and analyzed on 12/07/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-488774/1-A)

Manual Integrations and adjustments to Regions of Interest (ROI) were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.HPPG-SFU-TU153B-B-001 (160-40096-1), (LCS 160-488774/2-A), (MB 160-488774/1-A), (160-40094-A-1-E) and (160-40094-A-1-K DU)

During analysis the pulser (used for the daily checks) was left on inadvertently which caused the scaling to be greater than normal. Manual integration was performed in order to "zoom in" to the correct scaling for the samples. Both, the original and the "zoomed in" spectra PDF's, are included in the deliverable. HPPG-SFU-TU153B-B-001 (160-40096-1), (LCS 160-488774/2-A), (MB 160-488774/1-A), (160-40094-A-1-E) and (160-40094-A-1-K DU)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC URANIUM (ALPHA SPECTROMETRY)

Sample HPPG-SFU-TU153B-B-001 (160-40096-1) was analyzed for Isotopic Uranium (Alpha Spectrometry) in accordance with DOE. The samples were dried on 10/28/2020, prepared on 11/10/2020 and analyzed on 12/07/2020.

The method blank (MB) Z-score is within limits and is located in the level IV raw data. (MB 160-488775/1-A)

Manual Integrations and adjustments to Regions of Interest (ROI) were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.HPPG-SFU-TU153B-B-001 (160-40096-1), (LCS 160-488775/2-A), (MB 160-488775/1-A), (160-40094-A-1-G) and (160-40094-A-1-J DU)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample HPPG-SFU-TU153B-B-001 (160-40096-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 10/28/2020, prepared on 11/04/2020 and analyzed on 12/02/2020.

The method blank (MB) z-score associated with Prep Batch 160-488209 is within limits and is stored in the level IV raw data. (MB 160-488209/1-A)

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often,

Job ID: 160-40096-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

APTIM

CHAIN OF CUSTODY

Ref. Document # 501197RSY-019

Page 1 of 2

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik

Phone #: (619)213-3389

Send Report to: Rose Condil

Phone/Fax Number: 415-987-0760

Address: 4005 Port Chicago Hwy

Sample Lead: Lewis, Devin

Sample Tech(s):

Project Number: 501197

Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action

Project Location: San Francisco, CA

Purchase Order #: 1159058

Shipment/Pickup Date: 10/23/2020

Waybill Number: 4957 0225 4400

Lab Destination: Test America (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63046

Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

	Collection Information						Analysis Requested								
Sample ID	Date	Time	Method	Matrix	# of Containers	Preservatives (water) / Preservatives (soil) / Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma		Strontium-90 (EPA 905 MOD)	Ra-226 by Alpha spec, Isotopic U (234, 235/6, 238)		Isotopic Pu (238, 239/240)	Dose Rate uR/Hr	Evidence Bag ID	Comment
HPPG-SFU-TU153B-B-001	10/23/2020	11:31	G	SO	1	16 oz. plastic jar	X		X	X		X	4	D1189471	

Special Instructions: 21 day ingrowth results only
Analyze for Total Strontium as a screening step, and isotopic Sr-90 only if Total Strontium is above project action limit of 0.331 pCi/g

Turnaround Time: 3-day ☐ 10-Day ☐ 28-day ☐ Other ☐

Level of QC Required: I ☐ II ☐ III ☐ Project Specific ☐

Method Codes C = Composite G = Grab **Matrix Codes:** DW = Drinking Water ; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water, CP = Chip Samples; A = Air ; ABS = Asbestos, PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/23/2020 14:28	SHIPPEDTOLAB Via FE		10/26/2020 08:30

*** Last 3 transfers shown above - Complete list of transfers on last page ***

160-40096 Chain of Custody

All Transfers for COC 501197RSY-019

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		10/23/2020 14:28	SHIPPEDTOLAB	Michaelwinlings	10/26/2020 08:38

Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40096-1
SDG Number: D1189471

Login Number: 40096
List Number: 1
Creator: Korrinhizer, Micha L

List Source: Eurofins TestAmerica, St. Louis

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40096-1
SDG: D1189471

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
A-01-R	Isotopic Plutonium and Neptunium (Alpha Spectrometry)	DOE	TAL SL
A-01-R	Isotopic Uranium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy
None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40096-1
SDG: D1189471

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40096-1	HPPG-SFU-TU153B-B-001	Solid	10/23/20 11:31	10/26/20 08:38	

Client Sample Results

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40096-1
SDG: D1189471

Client Sample ID: HPPG-SFU-TU153B-B-001

Date Collected: 10/23/20 11:31
Date Received: 10/26/20 08:38

Lab Sample ID: 160-40096-1

Matrix: Solid

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	0.0382	U	0.0597	0.0598	0.160	0.0463	pCi/g	11/25/20 14:30	12/11/20 06:24	1

Carrier	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*106*		*40 - 110*	*11/25/20 14:30*	*12/11/20 06:24*	*1*

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	**0.00794**		0.0112	0.0112	0.100	0.00653	pCi/g	11/10/20 16:55	12/07/20 15:19	1
Plutonium-239/240	0.00397	U	0.00795	0.00796	0.100	0.00462	pCi/g	11/10/20 16:55	12/07/20 15:19	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Pu-242 (T)	*89.4*		*30 - 110*	*11/10/20 16:55*	*12/07/20 15:19*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-234	**0.308**		0.0520	0.0581	0.250	0.00504	pCi/g	11/10/20 17:08	12/07/20 15:14	1
Uranium-235/236	**0.0162**		0.0132	0.0133	0.100	0.00627	pCi/g	11/10/20 17:08	12/07/20 15:14	1
Uranium-238	**0.335**		0.0542	0.0611	0.250	0.00503	pCi/g	11/10/20 17:08	12/07/20 15:14	1

Tracer	*%Yield*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*77.7*		*30 - 110*	*11/10/20 17:08*	*12/07/20 15:14*	*1*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.0945	U	0.158	0.158		0.0993	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Actinium-227	0.168	U	0.268	0.269		0.188	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Bismuth-212	-0.327	U	0.593	0.594		0.465	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Bismuth-214	**0.287**		0.0868	0.0918		0.0350	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Cesium-137	0.0160	U	0.0301	0.0301	0.0700	0.0229	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Lead-210	0.437	U	0.951	0.953		0.761	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Lead-212	**0.311**		0.0598	0.0721		0.0278	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Lead-214	**0.317**		0.0832	0.0895		0.0373	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Potassium-40	**7.28**		0.946	1.20		0.0716	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Protactinium-231	-0.588	U	1.83	1.83		1.49	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Protactinium-234	-0.0700	U	0.197	0.197		0.160	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Radium-226	**0.287**		0.0868	0.0918	0.200	0.0350	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Radium-228	0.0945	U	0.158	0.158		0.0993	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Thallium-208	**0.0831**		0.0590	0.0596		0.0271	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Thorium 228	**0.311**		0.0598	0.0721		0.0278	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Thorium-232	0.0945	U	0.158	0.158		0.0993	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Thorium-234	-0.272	U	0.914	0.915		0.748	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Uranium-235	0.160	U	0.219	0.220		0.242	pCi/g	11/04/20 13:46	12/02/20 13:39	1
Uranium-238	-0.272	U	0.914	0.915		0.748	pCi/g	11/04/20 13:46	12/02/20 13:39	1

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-490265/23-A
Matrix: Solid
Analysis Batch: 491588

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490265

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Total Beta Strontium	-0.02016	U	0.0539	0.0539	0.160	0.0460	pCi/g	11/25/20 14:30	12/11/20 07:07	1

Carrier	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Sr Carrier	*96.3*		*40 - 110*	*11/25/20 14:30*	*12/11/20 07:07*	*1*

Lab Sample ID: LCS 160-490265/1-A
Matrix: Solid
Analysis Batch: 491444

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490265

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	7.76	6.013		0.491	0.160	0.0470	pCi/g	77	75 - 125

Carrier	*LCS %Yield*	*LCS Qualifier*	*Limits*
Sr Carrier	*109*		*40 - 110*

Lab Sample ID: 160-40096-1 DU
Matrix: Solid
Analysis Batch: 491588

Client Sample ID: HPPG-SFU-TU153B-B-001
Prep Type: Total/NA
Prep Batch: 490265

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
Total Beta Strontium	0.0382	U	0.02031	U	0.0527	0.160	0.0417	pCi/g	0.16	1

Carrier	*DU %Yield*	*DU Qualifier*	*Limits*
Sr Carrier	*106*		*40 - 110*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Lab Sample ID: MB 160-488775/1-A
Matrix: Solid
Analysis Batch: 491105

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 488775

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Uranium-234	0.0000	U	0.0152	0.0152	0.250	0.0125	pCi/g	11/10/20 17:08	12/07/20 15:14	1
Uranium-235/236	0.002733	U	0.00947	0.00947	0.100	0.00636	pCi/g	11/10/20 17:08	12/07/20 15:14	1
Uranium-238	-0.002192	U	0.0181	0.0181	0.250	0.0153	pCi/g	11/10/20 17:08	12/07/20 15:14	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Uranium-232	*81.2*		*30 - 110*	*11/10/20 17:08*	*12/07/20 15:14*	*1*

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)

Lab Sample ID: LCS 160-488775/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 491106 — **Prep Batch: 488775**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Uranium-234	3.18	3.300		0.328	0.250	0.0121	pCi/g	104	84 - 120
Uranium-238	3.26	3.432		0.339	0.250	0.00541	pCi/g	105	82 - 122

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Uranium-232	*78.7*		*30 - 110*

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Lab Sample ID: MB 160-488774/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 491103 — **Prep Batch: 488774**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.005594	U	0.0194	0.0194	0.100	0.0150	pCi/g	11/10/20 16:55	12/07/20 15:19	1
Plutonium-239/240	0.003733	U	0.00747	0.00747	0.100	0.00434	pCi/g	11/10/20 16:55	12/07/20 15:19	1

Tracer	*MB %Yield*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Pu-242 (T)	*92.5*		*30 - 110*	*11/10/20 16:55*	*12/07/20 15:19*	*1*

Lab Sample ID: LCS 160-488774/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 491099 — **Prep Batch: 488774**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Plutonium-238	2.61	2.527		0.255	0.100	0.0205	pCi/g	97	80 - 125
Plutonium-239/240	2.64	2.457		0.248	0.100	0.00633	pCi/g	93	81 - 125

Tracer	*LCS %Yield*	*LCS Qualifier*	*Limits*
Pu-242 (T)	*97.3*		*30 - 110*

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-488209/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 490647 — **Prep Batch: 488209**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.02805	U	0.199	0.199		0.106	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Actinium-227	0.01440	U	0.451	0.451		0.280	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Bismuth-212	0.0000	U	0.189	0.189		0.383	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Bismuth-214	0.01315	U	0.147	0.147		0.119	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Cesium-137	-0.02984	U	0.0378	0.0379	0.0700	0.0533	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Lead-210	1.586		1.34	1.36		0.890	pCi/g	11/04/20 13:46	12/02/20 13:51	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-488209/1-A
Matrix: Solid
Analysis Batch: 490647

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 488209

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Lead-212	0.009318	U	0.101	0.101		0.0824	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Lead-214	0.01598	U	0.107	0.107		0.0856	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Potassium-40	-0.1967	U	0.997	0.997		0.304	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Protactinium-231	0.0000	U	0.158	0.158		1.98	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Protactinium-234	0.01447	U	0.0320	0.0320		0.216	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Radium-226	0.01315	U	0.147	0.147	0.200	0.119	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Radium-228	0.02805	U	0.199	0.199		0.106	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Thallium-208	-0.004688	U	0.00594	0.00596		0.0547	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Thorium 228	0.009318	U	0.101	0.101		0.0824	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Thorium-232	0.02805	U	0.199	0.199		0.106	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Thorium-234	-0.5789	U	0.465	0.470		0.422	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Uranium-235	0.06692	U	0.212	0.212		0.348	pCi/g	11/04/20 13:46	12/02/20 13:51	1
Uranium-238	-0.5789	U	0.465	0.470		0.422	pCi/g	11/04/20 13:46	12/02/20 13:51	1

Lab Sample ID: LCS 160-488209/2-A
Matrix: Solid
Analysis Batch: 490648

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 488209

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits
Americium-241	96.4	98.24		10.3		0.585	pCi/g	102	87 - 116
Cesium-137	26.7	26.94		2.91	0.0700	0.128	pCi/g	101	87 - 120
Cobalt-60	9.50	9.522		1.03		0.0428	pCi/g	100	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40096-1
SDG: D1189471

Rad

Leach Batch: 487040

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40096-1	HPPG-SFU-TU153B-B-001	Total/NA	Solid	Dry and Grind	
160-40096-1 DU	HPPG-SFU-TU153B-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 488209

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40096-1	HPPG-SFU-TU153B-B-001	Total/NA	Solid	Fill_Geo-21	487040
MB 160-488209/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-488209/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 488774

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40096-1	HPPG-SFU-TU153B-B-001	Total/NA	Solid	ExtChrom	487040
MB 160-488774/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-488774/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Prep Batch: 488775

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40096-1	HPPG-SFU-TU153B-B-001	Total/NA	Solid	ExtChrom	487040
MB 160-488775/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-488775/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Prep Batch: 490265

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40096-1	HPPG-SFU-TU153B-B-001	Total/NA	Solid	DPS-0	487040
MB 160-490265/23-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-490265/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	
160-40096-1 DU	HPPG-SFU-TU153B-B-001	Total/NA	Solid	DPS-0	487040

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40096-1
SDG: D1189471

Method: 905.0 - Total Beta Strontium (GFPC)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Sr
Lab Sample ID	Client Sample ID	(40-110)
160-40096-1	HPPG-SFU-TU153B-B-001	106
160-40096-1 DU	HPPG-SFU-TU153B-B-001	106
LCS 160-490265/1-A	Lab Control Sample	109
MB 160-490265/23-A	Method Blank	96.3

Tracer/Carrier Legend

Sr = Sr Carrier

Method: A-01-R - Isotopic Plutonium and Neptunium (Alpha Spectrometry)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		Pu-242 (T)
Lab Sample ID	Client Sample ID	(30-110)
160-40096-1	HPPG-SFU-TU153B-B-001	89.4
LCS 160-488774/2-A	Lab Control Sample	97.3
MB 160-488774/1-A	Method Blank	92.5

Tracer/Carrier Legend

Pu-242 (T) = Pu-242 (T)

Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)

Matrix: Solid — **Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)
		U-232
Lab Sample ID	Client Sample ID	(30-110)
160-40096-1	HPPG-SFU-TU153B-B-001	77.7
LCS 160-488775/2-A	Lab Control Sample	78.7
MB 160-488775/1-A	Method Blank	81.2

Tracer/Carrier Legend

U-232 = Uranium-232